Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

FIRST OF THE NEW DIESEL LOCOMOTIVES

ONE SHILLING   11 JULY 1957   VOL 117   NO 2929

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Model Engineer

ONE SHILLING | 11 JULY 1957 | VOL. 117 | NO 2929

Published every Thursday Subscription 58s. 6d. (USA and Canada $8.50) post free

In this issue

Next week

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Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

THE president of the Society of Model and Experimental Engineers, the Earl of Northesk, will open this year's Model Engineer Exhibition on Wednesday, August 21. The exhibition will remain open until August 31.

I am pleased to announce, also, that Lord Northesk has agreed to act as chairman of the panel of judges which will adjudicate in the Duke of Edinburgh Trophy competition.

There will be an unexcelled array of first-class models, covering all facets of model engineering, on which the enthusiast may feast his eyes. New this year will be Puzzle Corner: a display of ingenious devices to test your powers of technical detection and observation.

For example, Philips Electrical will get you guessing with an echo well. This instrument plays back, after a short interval, anything said to it, giving the effect of an echo. Siemens are displaying a noughts and crosses machine, and Mallards will show their disappearing ball which vanishes through a hole when anyone tries to touch it.

Yes, there will be lots of fascinating and intriguing items at the 1957 Model Engineer Exhibition.

Tapped lines !

AS long ago as 1890 the Post Office engineering department in Wales was puzzled by the appearance of newly drilled holes in telegraph poles. The culprit was found to be a very colourful gentleman in the nature of a woodpecker, apparently attracted by the reverberation in the pole caused by the vibratory hum of the wires and mistakenly assuming there was a nice feast of insects and grubs inside the pole. The bird slogged away to within half an inch of the opposite side of the pole !

In the succeeding years many others of the woodpecker family—mostly the larger green and the greater spotted variety—continued their attacks, although plugging the holes with compound and binding the wires and insulators with lead strip tended to lessen the trouble.

Some 19 million miles of wire in the Post Office telephone and telegraph network are now underground and there is less opportunity for woodpeckers. Nevertheless other members of the British fauna have developed an appetite for Post Office materials. Recently a dormouse was found fast asleep between a cable running up a pole and its protective casing. The dormouse had eaten a hole the size of a shilling in the lead sheathing of the cable and damaged a few telephone wires enclosed therein.

After this heavy meal it settled down for its winter sleep and was still in the coma of hibernation when the protective case was removed from the cable; in fact it remained so until the repair gang gave it a rude awakening, when it scurried off to another hiding place perhaps to find a lighter and more digestive meal than Post Office telephone cable.

Smoke Rings . . .

Popular northern figure

W. DOUGLAS MILLER, president of the Brighouse SMEE, is a popular figure in Northern circles. He has himself been a model engineer since the tender age of ten and his magnificent 7¼ in. gauge *Duchess of Brighouse* is his *chef d'oeuvre* up to now. She is often steamed on her home track, of course, and has been seen at most of the Northern exhibitions, working under compressed air.

Mr Miller is managing director of John W. Miller and Son, who manufacture lubricants for use in industry and agriculture. He served in the Navy in both world wars and felt that he was fortunate that the last two years of his service in the second world war was in the Admiralty Salvage Department. He did good work both in home waters and across the Channel. His salvage team on s.v. *Swin* had many difficult and hazardous tasks and for their many outstanding successful operations under his leadership he was awarded the MBE.

Keen yachtsman

He has been an enthusiastic yachtsman for over 30 years. Three of his yachts have been converted or refitted by himself. Two were motor cruisers

W. Douglas Miller

and the latest, a ten ton yawl *Voluta*, has this Whitsun taken part in the annual sailing race from Fleetwood to Ramsey, IOM. He spends as much time aboard as a busy life permits, sailing each weekend whenever possible.

He is also owner of one of the finest showman's engines in England, the Fowler *Excelsior*, which has been fully described in these pages.

It is owing to his intense interest in model engineering generally that the Brighouse Society enjoy the facilities on his excellent private grounds on long lease and modest terms. The members themselves have put in a vast amount of energy in building the track, the boating pond, and the clubhouse.

Their club days are widely attended and an account of their latest one appears on pages 50 and 51.

Contacting Mayflower II

DURING the voyage of *Mayflower II* the Post Office radio stations handled 226 messages containing 8,489 words. There were also six radio telephone calls during the first few days of the voyage.

Throughout the whole journey the Post Office radio stations at Land's End and Portishead maintained constant communication with *Mayflower II*. From the time she left Plymouth on April 20 until April 24 when she was about 300 miles south west of Land's End, communication was by radio telephone through Land's End Radio Station, despite the fact that the ship's sails, particularly when they were wet, lowered the efficiency of her aerial system. After April 25 until *Mayflower II* reached Provincetown on June 13, communication was by wireless telegraph through Portishead Radio Station.

The equipment aboard allowed only limited transmissions, inasmuch as it was operated by batteries which, after 30 minutes' transmission, had to be recharged by a petrol engine, fuel for which was strictly rationed. Transmissions were also limited on occasions when all hands were aloft because of danger from the live aerial.

USS Constitution

MR B. G. Phillips, who was the author of the recent short series of articles in MODEL ENGINEER on USS *Constitution*, has received a very pleasant letter from an American reader. It is from Mr Roy F. Anderson, of San Francisco, and he writes:

"It has been with a great deal of pleasure that I have been reading your splendid articles on the US frigate *Constitution*.

"I had intentions of some day building such a model, but I was diverted to 'monkey wrench' sailing and then into locomotives. I am now the president of the Golden Gate Live Steamers so I am sure that there will be little chance of my doing any ship models of the type of *Constitution*.

"The enclosed material on *Constitution* is self explanatory. It has been collected over a period of years and I cannot think of a better or more appreciative recipient than the writer and builder of the present article now running in the ME.

"I had the privilege of visiting the *Constitution* in 1933 when it visited the San Francisco Bay, and just two years ago at its berth at the Charlestown Navy Yard, Boston. It was a thrill to stand on the deck of the ship that has witnessed 180 years of marine history."

The material which Mr Anderson sent was a most interesting collection of articles, photographs, and drawings of *Constitution*.

From this and other material which has come to light as a result of the articles it appears that Mr Phillips has produced an accurate interpretation of the ship. There may be doubt about some matters of detail but these are debatable according to the period.

Cover picture

First of the new 0-B-B-0 diesel locomotives to be used for mixed traffic work on British Railways. Joseph Martin writes about these "push-button" engines on pages 39 to 41.

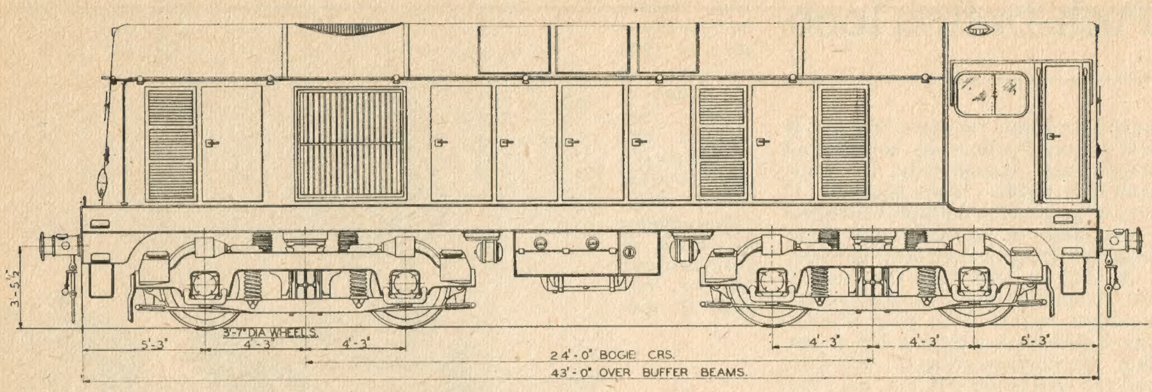
Brighter Underground

UNPAINTED aluminium coaches on the London Underground system have proved so successful that their use is to be increased. Three new tube trains are on order; one, now being completed by Metropolitan-Cammell Carriage and Wagon Co. will go into service this month (July); the other two, which are being constructed by Gloucester Railway Carriage and Wagon Co. and Birmingham Railway Carriage and Wagon Co. are expected to be ready by September.

These new trains will have Metalastik suspension, which has shown great benefits during trial use, and the interior of the coaches will be finished in two-tone grey and maroon, with bird's-eye maple plastic for the end pannelling. Illumination will be by "sun tan" flourescent lamps.

Non-facing garden seats have proved very unpopular, say London Transport, so this seating arrangement will be discontinued in the new trains.

Another worth-while innovation is the introduction of a large destination blind high up on the front of the train where it may easily be read by passengers waiting on crowded platforms.



Above and below: Side and front elevations

PUSH-BUTTON LOCOMOTIVE

JOSEPH MARTIN sees the driver, white-coated, seated at his desk . . . a breakfast cooker close at hand. This is Britain's first main-line locomotive for the Railway of Tomorrow

WHEN the busy little Lancashire town of Newton-le-Willows dreams of the past it remembers the time when history passed through it behind a banner of black smoke. This countryside witnessed the first triumph of the *Rocket* and the inaugural run of the world's first real passenger railway, the Liverpool and Manchester.

It was only a little beyond Newton itself, at Parkside, where the engines of the Liverpool and Manchester stopped for water, that history also demanded the weird aptness of the world's first railway accident when the flurried Mr Huskisson fell in front of a moving train.

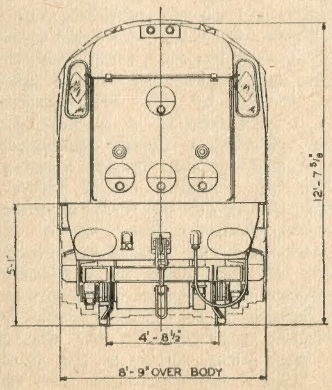
And now, more than a century and a quarter later, a puff of smoke from Newton-le-Willows signals the birth on another era. But this time the smoke is blue.

It is diesel smoke.

I was at Newton-le-Willows when the English Electric Company officially handed over the first main-line diesel electric locomotive to be completed for British Railways as part of their colossal modernisation plan. Precisely at 2.30 in the afternoon the clangour in the great Vulcan Foundry died away to a hush. The gantries ceased moving overhead and the men in their bright blue overalls, with girls in their distinctive caps of the same colour, hurried down a sunlit nave where the spotless new diesel awaited homage in Robert Stephenson's cathedral of Steam.

In a parallel nave were the live-steam men who are engaged in these latter days on the construction of spare boilers, with Robert Stephenson's beam engine of 1823, graceful in blue and white, standing proudly where they work. They leant over a low barrier as though they were willing to watch the ceremony so long as it was clearly understood that their own affections lay elsewhere. . .

Such then was the picture at Robert Stephenson's Lancashire foundry when Lord Rusholme, chairman of the London Midland Area Board of British Railways, received the 1,000 h.p. Type A diesel electric locomotive from Sir George Nelson, chairman of the English Electric Company. From a step-ladder dais the two entered the clean, cool, neat cab where Lord Rusholme seated himself comfortably at one of the driving desks.



Soon afterwards the white-coated driver almost casually pressed a button. A green shutter rolled up from the track, and with a puff of light fumes from the roof and a nerve-jangling blast from the twin-tone horn the locomotive slid away into the June sunshine, its wheels turning sweetly in the confidence of instant power.

It was a simple ceremony, quite unlike the jubilations of 1830. Yet the railway histories of the future will, I think, spare a sentence for this June afternoon at Newton-le-Willows. The British public has not yet realised the implications of the railway plan, but when the total of some £1,240,000,000 has been spent—£365 million on the general modernisation of the freight services, £345 million on motive power, £285 million on passenger rolling stock and stations, £210 million on track and signalling, and £35 million on various extras such as sundry improvements, development and research—everyone will be conscious almost every day of what Lord Rusholme described as "the new era, and the new spirit, on the railways."

The D8000 which has its send-off at Newton-le-Willows is the first of a batch of 20 mixed locomotives ordered for the London Midland Region. Working from the Devons Road Depot in London, a base

Push-button loco

intended entirely for diesel traction, it will be used principally for hauling freight, and, occasionally, for work with light traffic. When necessary, it may be operated in multiple with other locomotives of various types from English Electric or from other builders.

As will be seen from the picture, the locomotive has a bonnet superstructure carried on a pair of two-axle bogies, with a driving cab at one end. The bogie wheel base is 8 ft 6 in. and the wheels are 3 ft 7 in. dia., the arrangement providing for a minimum curve of 3½ chains. With a length over the buffer beams of just 43 ft, and with an overall width of 8 ft 9 in. and an overall height of 12 ft 7⅝ in., the whole weighs 72 tons, all of which counts as adhesive weight. The maximum axle load is 18 tons.

Behind the cab we find the engine compartment containing the control cubicle, one of the traction-motion blowers and the power unit itself—an extremely compact unit, the main generator being bolted up solidly to the diesel engine, with an anxiliary generator overhung from the free end of the larger one to give a supply at 110 v. for the exhauster, compressor, traction-motor blowers, control gear, battery charging and lighting. At the free end of the diesel engine, cardan shafts and a bevel gear box take care of the radiator fan which draws air across the radiators and expels it through the locomotive roof.

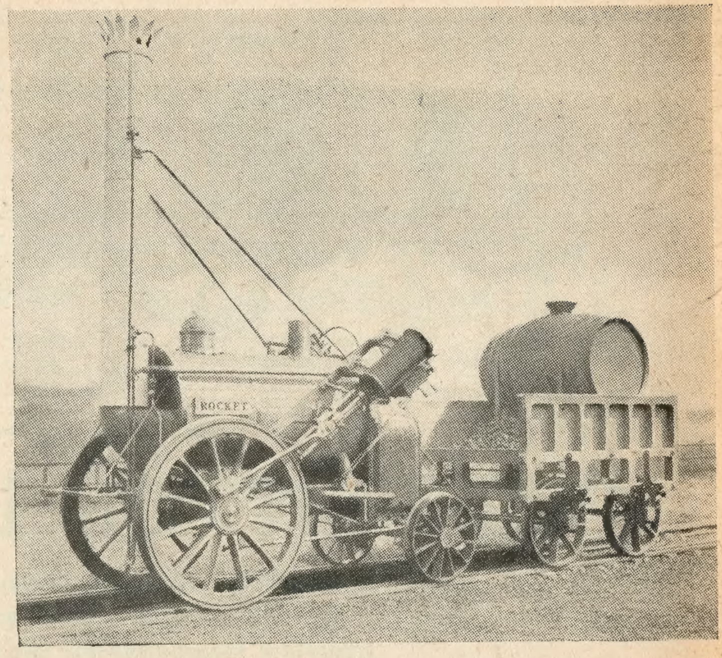
Its tractive effort

On the bulkhead behind the power unit the motor-driven fuel pump and the lubricating oil-priming pump are mounted, together with the fuel filters. Next to them, in the fan compartment, are the radiators, the roof-mounted radiator fan and the right-angle gear box for the fan drive; and beyond these again, in the end compartment, are the exhauster and compressor and the second traction motor blower.

Let us look at the power unit, the heart of it all. The power which gives the locomotive a maximum tractive effort of 42,000 lb.—19,500 lb. continuous rated—derives from the English Electric 8SVT Mk II diesel engine which develops 1,000 b.h.p. at 850 r.p.m. Using eight cylinders arranged in V formation, four a side, the engine operates on the four-stroke cycle and is supercharged by two Napier turbochargers driven by exhaust gas.

This engine, of course, drives the generator—a direct current, self-ventilated single-bearing machine with a continuous rating of 1,070 amps at 600 v. Besides having a separately excited winding for normal running, it is provided with a series winding to be used when it is connected across the battery for engine starting.

This replica built for Henry Ford in 1929 conforms to the design of Robert Stephenson and Company's original engine built in 1829. The locomotive with tender in working order weighed less than 8 tons



In turn, the output from the generator—varied by simultaneous control of diesel engine speed and field excitation—drives the four traction motors, each of which, through single-reduction spur-gearing, turns a pair of wheels and so, at the end of a curiously fascinating system, makes the whole thing *go*.

I have mentioned the auxiliary machines. The Reavell exhauster, a rotating vane type of machine normally running at about 1,000 r.p.m., provides the vacuum for the train brakes and may be speeded up to about 1,500 r.p.m. if the driver requires a more rapid release. In accordance with the standard practice on British Railways, the locomotive itself has air brakes. These, with the horns, sanding gear and control gear, are worked by the Westinghouse DVC3 compressors, a proportional valve ensuring a normal application of air and vacuum brakes together.

The two traction motor blowers supply the air for the four axle-hung, nose-suspended motors which are series-wound and have a continuous rating of 600 amps at a nominal voltage of 300. Anyone who examined the details of the D8000 would be especially interested in the devices for ventilation, such as the ducts and flexible bellows which lead the air from the blower to the air inlet at the commutator end of the motor.

I may add that the drive to the radiator fan in the roof from the end of the diesel engine crankshaft is by a splined shaft to the right-angle gear box and then vertically from the gear box through a shaft with flexible couplings interposed; and there is also, in the final drive, a centrifugal clutch to reduce the torque imposed on the fan when starting up or shutting down the diesel engine.

All the air drawn into the locomotive passes through oil-wetted filters. The radiator fan creates a cool flow past the power unit, the air travelling across from filters to other openings in the bulkhead between the fan compartment and the engine compartment. Oil and water for the diesel engine are cooled by a double bank radiator, one radiator panel being mounted on each side of the locomotive.

Of still greater interest is the control gear. Most of it occupies a transverse cubicle facing the cab, the remainder being mounted behind the cubicle on a bridge support which runs across the locomotive from cantrail to cantrail. Besides having special circuits to reduce wheel slip tendency the driver is warned by an indicator light, and the tractive effort automatically lessens. Other failures, faults or dangers are similarly announced by lights at the driving position, and in certain circumstances—if the pressure of the lubricating oil or the level of the cooling water is low—the diesel engine shuts down

before serious trouble can occur.

The control system, energised by electro-pneumatic and electro-magnetic contactors and relays, is of the Standard English Electric type which allows the speed of the diesel engine to be continuously varied (from 450 r.p.m. to 850) and also adjusts the loading on the engine so that the power output is automatically as high as it can be at the selected speed. In this way by keeping the engine at the lowest speed for the load demand, a saving is made in fuel—the tank carries 400 gallons—and in wear and tear as well.

I will not go further into the electrical details. Most readers will prefer to hear about the driver's controls, all of which are worlds removed from anything in the cab of a steam engine. They have been built very neatly into a prefabricated desk at each driving position. A locking arrangement on the master controller prevents anyone from running off with the locomotive when British Railways are not looking.

Let us suppose that you are driving. You button on your white coat—a coat chaste enough to advertise soap powder—and settle yourself handsomely in an upholstered seat. Having switched on the special heater if you feel chilly, you unlock the controller and address yourself to a handle which can now be moved from Off to Forward, to Reverse, or to Engine Only. You first turn it to the last of these three and then press a push button which connects the battery to the main generator and motors the engine until it fires.

Safety factor

Once this happens, you move the handle to select the direction of travel: thereafter you use a second handle to control the locomotive power output. To prevent any bad mistakes the controller handles and master key are interlocked.

For Engine Stop there is an independent button control. You also have two brake handles for applying the vacuum brake on the train or the air brake which is fitted to the locomotive only. Among your instruments you will see three air and vacuum gauges, a speedometer (maximum speed is 75 m.p.h.) and an ammeter indicating the main generator current.

You will also notice a deadman's pedal and an extra one for working the sanding gear. And if anything goes wrong there is a light to warn you, but I hope that this will not happen just when you are about to enjoy a cup of tea from the breakfast cooker. . .

In short, the D8000 is a locomotive for the mid-century—a signpost, said Lord Rusholme, "to the cleaner, quicker, and generally more efficient and reliable service" which British Railways have begun to provide. Its great drawback—one that stimulates prejudice where prejudice is bound to exist—is its appearance. The D8000, especially when it is viewed at close quarters, can hardly fail to impress But there is nothing about it to endear. Metaphorically as much as literally, it lacks warmth. It has exactly the charm of a prize-winning banana crate.

Let no one blame the builders. They have done what they were asked to do and they have done it superbly. What they could have done, given the chance, is suggested by their own privately-built *Deltic*, by far the most powerful diesel locomotive in the world. Look, too, at one of their latest locomotives for the East, an engine of positive grandeur, its shining black crossed by a broad red band which curves down at the front to make an arrow. The larger gauge accounts, admittedly, for the handsome bulk of this engine; but it does not account for the shape and colour.

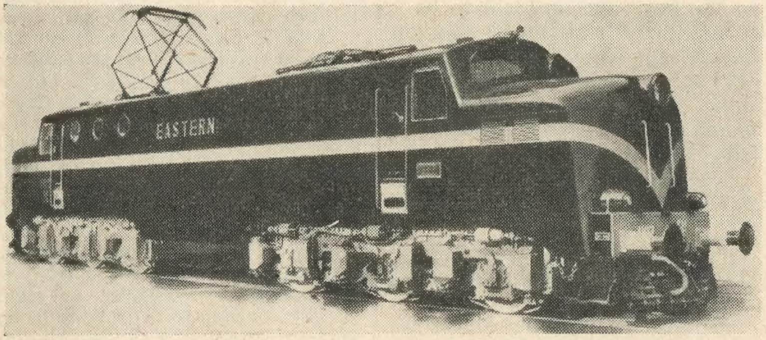
Someone has perhaps convinced British Railways that as we now live in boxes and work in boxes we should use boxes for travelling between them. The boxes, therefore, are coloured a plain self-effacing olive-green, so as to camouflage any hints of character that might perversely break through here and there. But the railway plan, no matter how many millions are spent on it, will not completely succeed unless some of the affection felt for the steam engine and the steam train can be transferred to the new system.

The electric locomotive needs even more character in its design than a steam locomotive if only because a steamer is alive when at rest. The solution is neither an artificial ornateness nor a neutral functionalism, but something that will create the impression at all times of great power finely controlled.

Having made these points, let us give the venture our blessing. After all, it is the old engines, already outdated, which win most favour today, and when today's engines come to the end of the line an equal sentiment should surround them all.

Those who still prefer to join Mrs Partington in brooming back the ocean should be gently reminded that when the first trains ran through Newton-le-Willows yells of protest and ridicule mingled with the cheers. Some objectors believed that the steam engine would encourage godlessness and others that it would discourage hens from laying. With them—probably in the latter group—history will range those who can find no good today in the second great era of rail traction. ▣

Handsome in black and red: an English Electric 3120 *h.p. locomotive for India*



Some modifications to an EW lathe

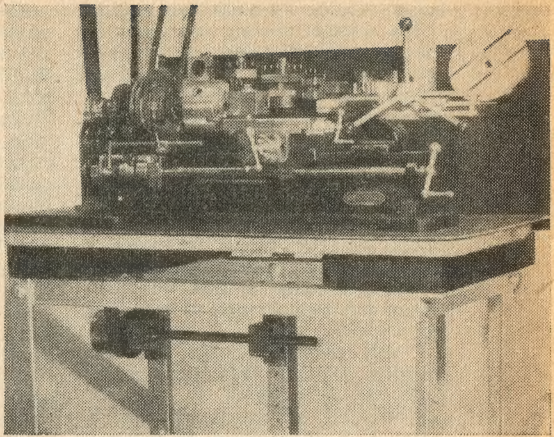


Fig. 1: Showing intermediate shaft for increasing the range of speeds

***MARTIN CLEEVE** designs a drive and stand for the EW lathe and gives some practical hints on cone pulleys for a multi-speed drive*

OPINIONS vary as to the best and most convenient method for belting up a lathe. Admittedly, at first sight, a " motorising unit " attached to the rear of the headstock appears to be a compact and satisfactory solution and it cannot be denied that it is very handy for lathes of the kitchen table variety, but for the larger machines, in my opinion, there are some objections to this method.

One lies in the extra space needed at the rear of the lathe; another in the fact that the short belt from the countershaft to the lathe offers a very inconvenient length for " inching " by hand, such as for die running or checking a set-up.

The shaft centres are also too close to allow for the satisfactory use of a flat belt with fast and loose pulleys—leaving, as alternatives, a clutch which is expensive to buy or troublesome to make, a swinging countershaft to slacken the belts—not the easiest of solutions—or control by the direct switching of the motor: a system not recommended for a centre lathe which, of all power tools, is perhaps the one machine calling for the most frequent stopping and starting and, therefore, the most likely to overheat a motor through so doing.

" Unit " motorising countershafts are supposed to save space but it is interesting to reflect upon the fact that the only space saved is that which is comparatively useless anyway: vertical space. Moreover, the lathe has to be that much farther forward to allow room for the motor and unit so, with equal logic, it could be argued that, of the two, a motorising unit requires more of the most valuable space: bench and horizontal floor area.

ADDITIONAL SPEEDS

While it is normal practice to drive fast and loose pulleys directly from a flat pulley on the motor shaft, the addition of an intermediate shaft similar to that shown under the lathe in the photograph (Fig. 1) will at once make possible a far greater range of speeds than those obtainable from the lathe cones and back gear.

In this case, a motor will be mounted upon the two lower horizontal angles, and will drive the right-hand end of the intermediate shaft through three-step cone pulleys: these will have a close ratio to avoid the excessively high or low speeds associated with most standard makes of cone pulleys.

When designing cone pulleys to give an additional speed range to a lathe it is as well to decide first on the maximum speed desired then, as the number of variables is often cut down owing to use having to be made of some stock pulleys, the required data are soon found.

Ratios and speed

In this case, the lower shaft drives the upper in the ratio of 3 : 7, and the EW lathe cones have ratios of 1 : 2, 1 : 1 and 2 : 1, or, half, neutral and double. From this it follows that if the lower shaft was driven through pulleys of equal diameter from a motor having a speed of 1,400 r.p.m. the upper countershaft speed would be 600 and the lathe speeds (neglecting back gear) would be 300, 600 and 1,200 r.p.m.

For this lathe it is thought that a top speed of 1,500 would be fast enough for comfortable working, taking into account the type of bearings and general rigidity, and it will be convenient to assume that this is the maximum decided upon. This will mean that the motor must drive the lower shaft faster, or in the ratio of 15 to 12.

Next, in order to get a further grip upon the situation, these figures (15 and 12) may be translated to inches and it will be seen, for instance, that calling them quarter inches and dividing by four gives pulleys with pitch diameters of 3¾ in. and 3 in.; the 3¾ in. to go on the motor and the 3 in. on the lower intermediate shaft. From this, the lowest range immediately becomes calculable since, in order that the belt tension shall remain constant, the lower range must be the exact reverse of the upper, i.e., a 3 in. on the motor and a 3¾ in. on the countershaft.

Finally, assuming that the lathe speeds are satisfactory when the intermediate shaft is driven at motor speed, the centre pulleys on our three-step cones must be in the ratio of 1 : 1. Here, regarding belt tension, a slight snag is introduced in that with pulleys of equal diameter the opposite sides of the belt become parallel and if one half of 3¾ in. plus 3 in. be taken as the diameters, the belt will be too slack. The correct diameters are supposed to be calculable but the formula is of more use to the mathematician as a recreational exercise than to the practical man who needs the pulleys, so to avoid this slackness (which increases as the distance between shafts decreases) it is best to add a little by guesswork to the figure arrived at by taking half the sum.

These figures in this case come to 3⅜ in., therefore, to this figure add, say, ⅛ in. making the pitch diameters of both 3½ in. At the worst this will cause the belt to become too tight when on this middle speed but this may be corrected easily by taking a further cut over one of them: if of wood this may be done in situ with the help of an improvised rest for a hand tool.

Summing up, our additional three-step close ratio cones will each have pitch diameters of 3 in., 3½ in. and

3¾ in., which, with a motor at 1,400 r.p.m. and flat pulleys of 3 in. to 7 in. ratio will give lathe speeds of:

High	375	750	1,500
Medium	300	600	1,200
Low	240	480	960.

Back gear, of course, will give a range of nine further low speeds making a total of 18.

It is worth noting that pulleys used for flat-belt drives should not be of too small a diameter. In reduction drives this applies particularly to the driving pulley: a small one here not only offers a reduced area of contact to the belt but also reduces the belt velocity and, since, as the belt speed is reduced a greater pull is required to transmit a given power, it will be appreciated that a small pulley offers a double tendency to belt slip.

A properly designed flat-belt drive should be capable of transmitting the full load power with a margin for overload, but without an unduly tight belt and without any necessity for the use of belt jams and other sticky horrors concocted to cover the incompetence of design engineers.

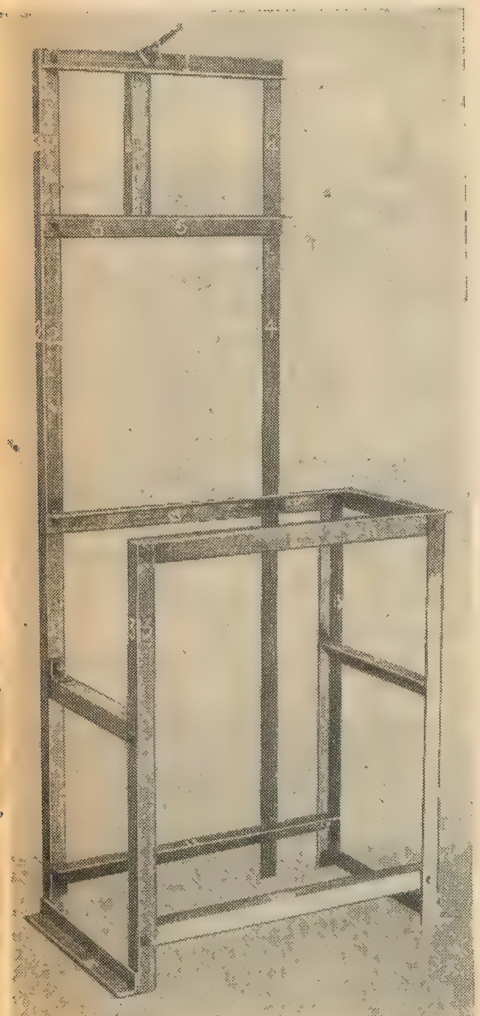
THE STAND

Whereas my larger stand for the ML7 was built from 2 in. × 2 in. × ¼ in. angle, the smaller stand here described was made from 1½ in. × 1½ in. × $\frac{3}{16}$ in. angle, but both were fixed together with ⅜ in. Whit. × ¾ in. "black" bolts and nuts. The drawing (Fig. 2) gives the chief overall dimensions, while the photograph (Fig. 3) shows what it looked like when nearing completion.

Referring to Fig. 2, it will be seen that the working height is shown as being 32 in. If it is desired to alter this to suit personal stature it should be remembered that the actual height of the lathe is further increased by the cross joists and top board. In this case, the joists are 2 in. thick and the board about ¾ in. Further, the lathe itself is mounted upon two separate packing blocks each of about ½ in. in thickness. The main 2 in. cross joists are slotted to allow for movement of the lathe for further belt tension adjustment as needed.

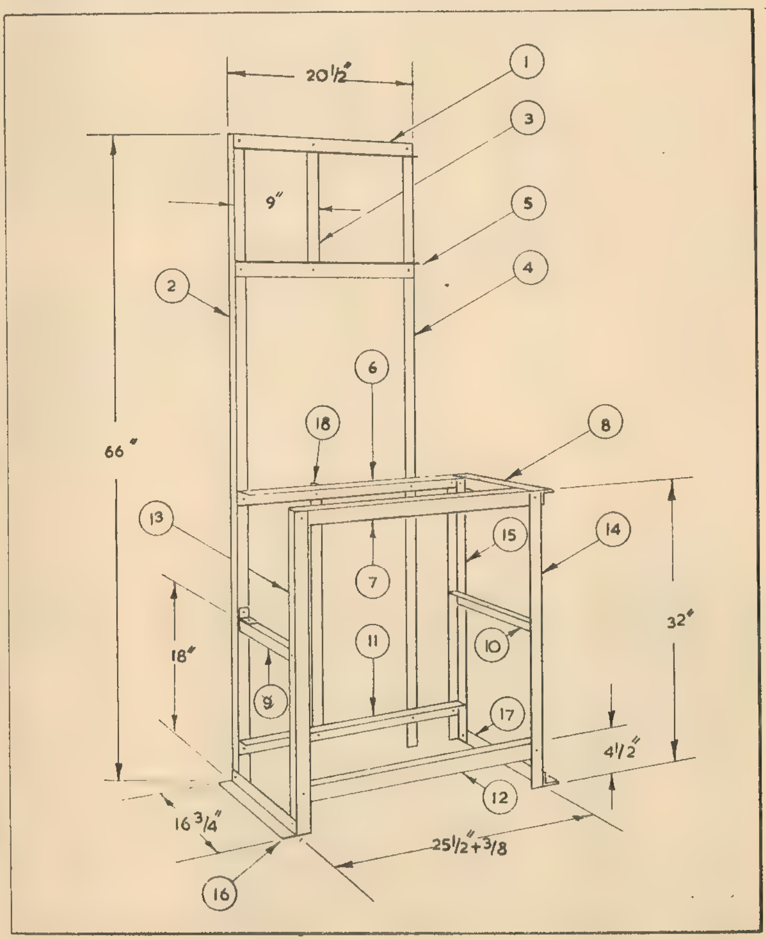
The construction of a steel stand of this kind is not such a major operation as it may seem at first; neither is it so very expensive. The total footage required (neglecting an angle bracket for angle No 9) amounts to only 41 ft and ½ in. I am not sure of the price today as I had some angle on hand which was bought some years ago, but if it is as much as one shilling per foot it will be seen that even adding a few feet for waste the price will not become prohibitive.

Bars of 1½ in. × $\frac{3}{16}$ in. equal angle steel are usually supplied in lengths



Left, Fig. 3: The stand, during erection

Below, Fig. 2: Dimensions of the stand



of from 16 ft to 18 ft. When buying this kind of material the most straightforward method is to order so many "bars," so for the purpose of suggesting a line of attack it will be assumed that three bars have been obtained and that each is of the minimum length of 16 ft. These require to be cut into pieces having the following lengths corresponding to the angle numbers shown in Fig. 2: Angle No 1, 20½ in.; No 2, 66 in.; No 3, 13½ in.; No 4, 66 in.; No 5, 20½ in.; No 6, 25¾ in.; No 7, 25½ in.; No 8, 15⅜ in.; No 9, 14⅞ in.; No 10, 14⅞ in.; No 11, 25¾ in.; No 12, 25½ in.; No 13, 32 in.; No 14, 32 in.; No 15, 32 in.; No 16, 16¾ in.; No 17, 16¾ in.; No 18, 29 in.

PREPARATION OF CUTTING SCHEDULE

Upon an odd sheet of paper prepare what may be termed a "cutting schedule" similar to that shown in the table, Fig. 4. To each of the three bars allot one column headed 1, 2 and 3. Commencing with the first column, glance through the list of individual lengths required and write the numerical key number starting with the longest, together with its actual length. Continue thus until the total reaches that of the bar and repeat for the second bar.

In the sample table given it will be seen that the first column totals 16 ft 4 in. but that transferring a 2 ft 8 in. length to the second column and substituting a 2 ft 1½ in. length will balance both columns 1 and 2 and allow for cutting waste and the fact that the extreme ends of the new bars are sometimes rather distorted through shearing.

The table will show that if all three bars are 18 ft in length there will be only 13 ft spare; admitted this will be in the form of several odd lengths, but even these are very handy at times.

I do not think it is necessary to go into minute details over the exact positions of the bolt holes: use one bolt and nut per joint and space symmetrically. To avoid fouling nuts from angle eight, the horizontal angles Nos 6 and 7 were tapped ⅜ in. Whit. at that corner.

During assembly, upright angles Nos 2 and 3 were slotted at the top for belt tensioning adjustment, also the spacing of angle No 3 was decided upon; this should give fairly close support to the lathe driving cone as shown in the photograph, Fig. 5.

After the photograph Fig. 3 had been taken, angle No 18 was added. Angles 2, 4 and 18 also were each drilled with a row of ¼ in. clearing holes at 1 in. pitch to give a further measure of adjustment between the upper and lower shafts. These holes may be seen just beneath the bearing blocks in Fig. 1. Corresponding holes in angle No 4 were not used but may be useful at a later date.

Position will vary

Referring to Fig. 5 again, note how angles 2, 3 and 4 have been drilled for the striking rod which carries the belt shifting forks. The actual position of this rod will vary slightly according to the diameter of the fast and loose pulleys; it should be about ½ in. clear of the pulley rims. If reversal is anticipated the forks should extend both sides.

BAR 1—16 ft		BAR 2—16 ft		BAR 3—16 ft	
Angle No	Length	Angle No	Length	Angle No	Length
2	5′ 6″	15	2′ 8″	1	1′ 8½″
4	5′ 6″	18	2′ 5″	3	1′ 1½″
13	2′ 8″	6	2′ 1¾″	5	1′ 8½″
14	2′ 8″	7	2′ 1½″	8	1′ 3⅜″
		11	2′ 1¾″	9	1′ 2⅞″
Total	16′ 4″	12	2′ 1½″	10	1′ 2⅞″
		16	1′ 4¾″	17	1′ 4¾″
		Total	15′ 0¼″	Total	9′ 8⅜″

Fig. 4: Example of a cutting schedule

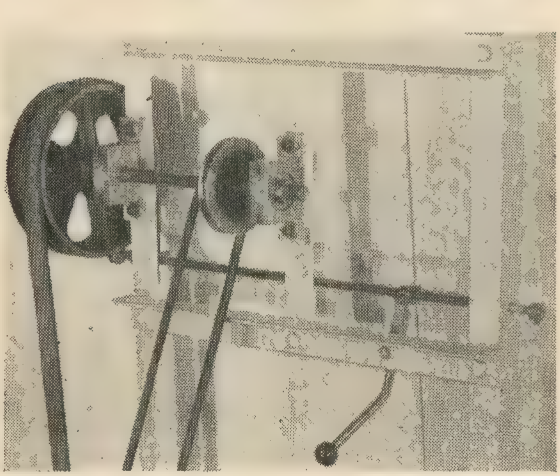


Fig. 5: The upper countershaft, showing arrangement of the belt shifting gear

To obtain the best results from this kind of stand it is not necessary to fix it to the floor but it should be anchored at the top end. Any screws and brackets used for this purpose need not be of very heavy dimensions; the chief idea here is to prevent the structure from starting to vibrate or rock due to any slight unbalance of the fast and loose pulleys. If the stand is in use in a house where noise would be objected to, the stand may be stood upon two door mats and the top anchored by one or two screws with the interposition of fairly thick rubber washers such as soft door or lavatory seat stops.

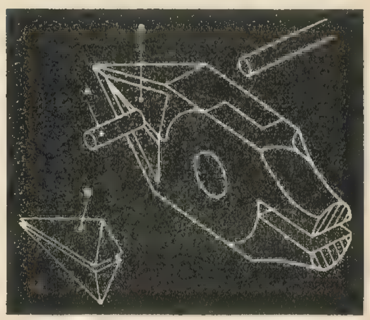
Angles Nos 9 and 10, apart from strengthening the structure, are handy fixings for a shelf, while a drawer for small tools can be fitted easily between the cross joists beneath the lathe.

A superficial clean down followed by a coat of quick-drying aluminium paint will make it look nice and satisfy a mind impatient to finish off the job and get the lathe working. ◼

WIRE NIPPER WITH "WIRE HOLDER"

THE illustration shows the jaws of a pair of wire nippers, fitted with rubber inserts B on the open side. These rubbers retain short ends of wires, such as A, after cutting off, until they are removed by the operator. Nippers modified in this way have obvious use where it is specially important to avoid short pieces of wire falling into vital places: an example is in the assembly of aero engines, where the temporary securing of small accessories by wire is often extensively necessary.

Digested from Anon., Praktiska tips for verkstaden-Modifierade avoitare "spratter" inte, in "Maskinjournalen" (Sweden), 7 (5) 1956, page 102. EPA Digest 1237(r).



BEGINNER'S WORKSHOP

Gudgeon Pin Locations

By GEOMETER

To prevent damage to cylinder walls, the gudgeon pins of an engine must be located against axial movement or provided with soft end wads to avoid unprotected contact—which, in the case of a mishap, produces score marks or grooves resulting in loss of compression and power, to rectify which either reboring or sleeving is necessary.

Depending on the constructor's ideas and what may be most convenient, a gudgeon pin can be fixed in the piston with the small end of the connecting rod forming the bearing; or the pin can be fully floating with bearings in both connecting rod and piston; or again, it can be fixed in the connecting rod with bearings formed in the piston bosses.

A fixed-in-the-piston gudgeon pin is generally located by a screw, as at *A* (left) and may be used on industrial engines and models. One boss of the piston is drilled and tapped, and the gudgeon pin drilled to accept the parallel turned end of the screw. In the larger sizes of application, the screw head can be drilled for a split pin, which prevents unscrewing by contact inside the piston skirt. In small sizes, the screw may be slit at the end and the legs opened inside the hollow gudgeon pin, using a small screwdriver.

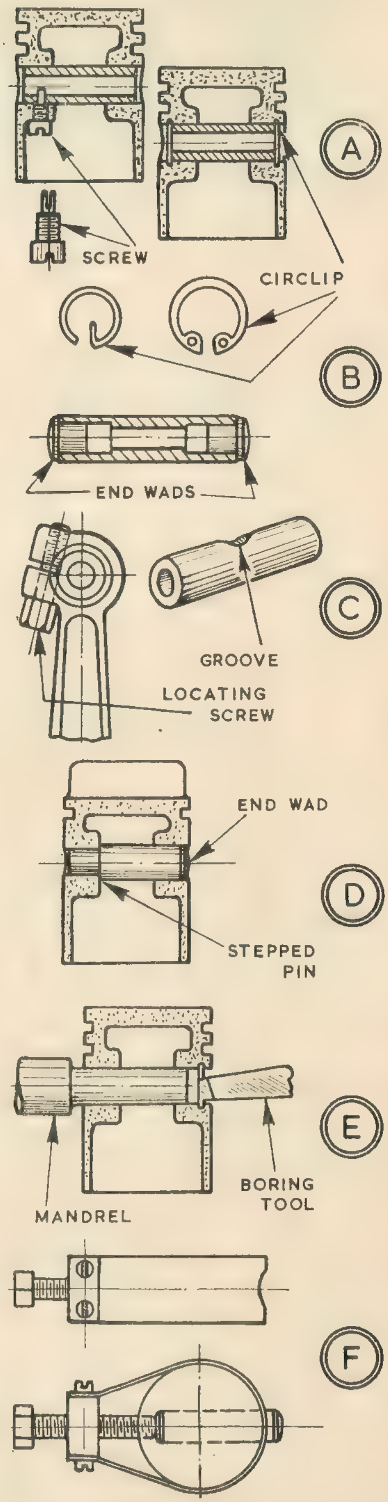
A fully-floating gudgeon pin may be either located or protected at the ends. When the pin is located, the piston bosses are machined with grooves for circlips, as at *A* (right) which obviate endwise movement. When the pin is protected, it carries pressed-in light-alloy end wads, as at *B*. In the case of circlips, the gudgeon pin should fit closely between them, and with end wads, the pin should fit comfortably in the cylinder—in each instance considerable endplay being avoided to guard against any suggestion of hammering which could disturb a circlip or allow a protected pin to cause a tapping noise.

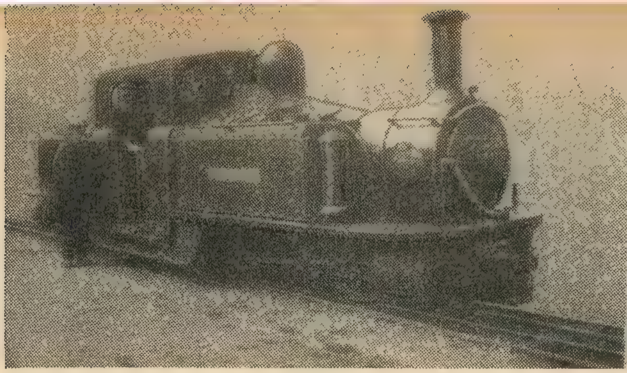
A fixed-in-the-connecting-rod gudgeon pin has a central groove, either continuous or tangential, as at *C*. A setscrew in the small end of the connecting rod intercepts the groove for endwise location, and has to be completely withdrawn for fitting or removing the gudgeon pin; it must also be tightened firmly for clamping. The setscrew may be fitted with a tab-type locking washer. This type of gudgeon pin must always be below the side of the piston, when, for testing, the latter is oscillated by hand on the pin and pushed side to side for the bosses to abut to the connecting rod.

An arrangement where a gudgeon pin is located one way and protected the other is as at *D*. The piston bosses are of different sizes and the pin stepped to suit, the larger end carrying an end wad. Such a pin can be used on a two-stroke engine with an inlet port in the cylinder wall, the smaller end of the pin being adjacent to the port, over which it will pass, and the larger protected end traversing the plain cylinder wall.

To provide a piston with circlip grooves, a mandrel can be machined in the chuck, and the piston pushed on, as at *E*, to be machined with a boring tool. Car and motor-cycle pistons usually employ circlips as at *B* (right), and the grooves to take them are square-sided. Small pistons, however, can be fitted with circlips from coils of spring wire, one end turned in to handle with small pliers. For these, the grooves should be rounded and slightly more than semi-circular.

Gudgeon pins should be a light interference fit in alloy pistons, and a thumb-press fit in bronze bushes. Bores in pistons should be reamed when the pistons have been heated in boiling water or hot rags; for fitting gudgeon pins, both pistons and pins should be similarly heated. For removing pins, an extractor can be made, as at *F*, using a flexible band attached to a block tapped for a pressure screw. ▣





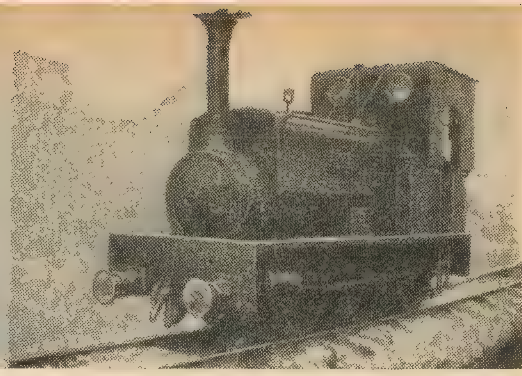


Fig. 1: *Fairlie engine* MERDDIN EMRYS, *built by the Festiniog Railway Company*, 1879. *Fig.* 2: *The* 2 *ft* 8 *in. gauge* 0-6-0 TERTIUS *by Manning Wardle and Company*

G. WOODCOCK now turns his attention to . . .

Narrow-gauge locomotives

. . . model and otherwise

If by the term narrow-gauge locomotive we mean any engine having a gauge less than the standard 4 ft 8½ in., then the world's first practical narrow-gauge engine for commercial use was built in 1829 by the firm of Robert Stephenson and Company. This engine, about which not a great deal is known, was to the order of the Pen-y-darren Iron Works, South Wales, and was for an 0-6-0 built for the 3 ft gauge plate way. Stephenson's order book describes it as "for Mr Forman"—Forman being with Thompson, the two partners of the iron works at that time.

Then in 1848 the Northfleet Ironworks, Northfleet, Kent, built two remarkable engines for the 4 ft gauge Padarn Railway, North Wales. Of 0-4-0 type, the design had a wheelbase of no less than 12 ft ½ in. No framing was used, the wheels being carried in brackets bolted to the boilers. One of these engines, *Fire Queen*, is still preserved at the workshops of the Padarn Quarry Company.

One or two other examples were turned out during the late 1850s, notably by a Mr Watt Boulton of Portland Street Works, Ashton-under-Lyne, whose works are now those of the National Oil Engine Company.

It was, however, in 1863 that the first real examples—and the most noteworthy ones—were built. These were *Prince* and *Princess*, built to the order of C. Spooner, engineer of the 1 ft 11½ in. gauge Festiniog Railway, Wales. The builders were a London firm, George England and Company, of the Hatcham Ironworks, Old Kent Road.

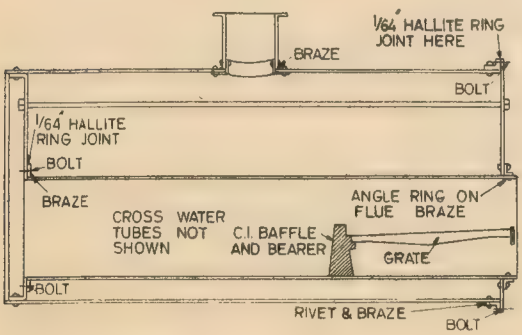
Prince and *Princess* were designed to haul loads of 50 tons at approximately 15 m.p.h. The main dimensions were: cylinders 8 in. × 12 in.; coupled wheels (4) 2 ft dia.; wheelbase 4 ft 6 in.; boiler pressure 200 lb. (which was very high for the period, and later lowered to 140 lb.); grate area 4 sq. ft; cost £900 each. So far as I am aware these engines are still in existence.

Other similar engines were built for the Festiniog Railway, all of the 0-4-0 type with small tenders. After these engines Englands built for the line an 0-4-4-0 Fairlie *Little Wonder*, and this was one of the last engines turned out by them, as the works closed down in September 1869.

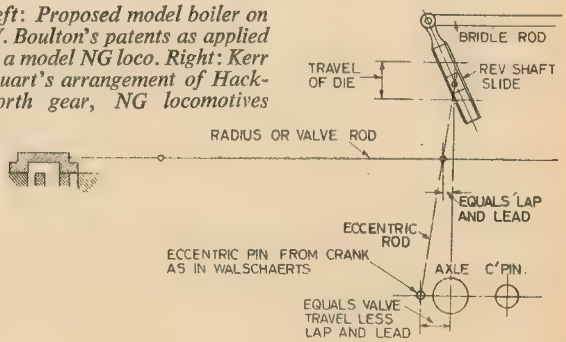
Other Fairlie engines were later supplied to the Festiniog Railway Company by the Avonside Engine Company, of Bristol, but the last two engines of this type—one of which (Fig. 1) is reproduced—were built by the company itself in 1879 and 1885. In both cases the boilers were supplied by the Avonside Engine Company.

By the period 1870-5 many other concerns were producing engines for narrow gauges. Fig. 2 shows a 2 ft 8 in. gauge engine of 1885 by Manning Wardle and Company of Leeds.

In 1864 a Mr John Leather started



Left: *Proposed model boiler on W. Boulton's patents as applied to a model NG loco. Right*: *Kerr Stuart's arrangement of Hackworth gear, NG locomotives*



the Hunslet Engine Company, also of Leeds, which has over the years turned out a very large number of narrow-gauge engines—and which today still turns out one or two for overseas duty.

Most of the larger builders at one time or another produced engines for the narrow gauge, while some such as Peckett, of Bristol, Andrew Barclay and Company, of Kilmarnock, and the Avonside Engine Company became very well known in this connection.

It is, however, my view that engines of some of the smaller firms—often tucked away in rural districts— were of the greatest charm.

Such a one, on whose footplate I spent a very happy day about a quarter of a century ago, is featured in Fig. 3. This engine was a product of the works of Mr Stephen D. Lewin, of Mount Street, Poole, Dorset (built 1875).

Mr Lewin, a gentleman of wealth, ran his works as a hobby, with the assistance of a Mr Tarrant, who came from the Devizes firm of Brown and May, well known for traction-engine work.

10 in. driving wheels

A large number of narrow-gauge engines of very many types were constructed by Lewin, including some very small engines of 0-4-0 type of 19 in. gauge for the Laxey Mines, Isle of Man. These were described in *Engineering* at the time they were built, in 1878. Of minute dimensions, the cylinders were 3 in. × 4 in. with 10 in. coupled wheels. They were 6 ft in length and 4 ft overall height.

Lewin also produced one or two slightly larger engines in which the power unit was placed on top of the boiler, as in traction-engine work. These went to the St James's Gate Brewery, Dublin, and were aptly named *Hops* and *Malt**. He produced also the same types in the standard gauge, but this is outside the present scope.

**The subject of an article by Joseph Martin in June 27 issue.*

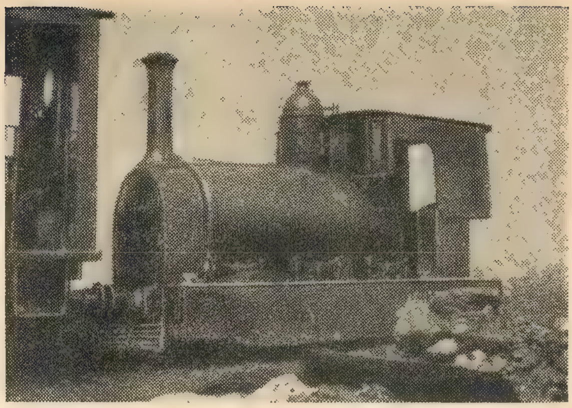


Fig. 4: *An* 0-6-0 *engine, by Bellis and Morecom, Birmingham*

Fig. 4 shows a very interesting narrow-gauge engine for 2 ft 8 in. gauge built by the Birmingham firm of Bellis and Morecom, being one of the only two locomotives ever built by them. In both these cases a marine type boiler was used.

Fig. 5 depicts a derelict engine by Andrew Barclay and Company which I stumbled upon some years ago in a breaker's yard.

Having made models in a variety of sizes and different scales I can say with safety that the most suitable type of engine for general all round work is the 0-4-2, with the 0-4-0 as a runner up.

The 0-4-2 type found favour on a large number of narrow-gauge lines, such as the Corris, Talyllyn, Kerry Tramway, Chatterton and Upnor Tramway, to name but a few. The 0-4-0 was more favoured for industrial use, but nevertheless saw service on such lines as the Sand Hutton Light Railway, and certain Irish tramways.

If an 0-4-0 is selected it should be borne in mind that if the wheelbase is long the engine will be steady upon the track at the expense of road-holding qualities whereas if the wheelbase is short then the engine will hold the road well, but will pitch and roll at any speed. Therefore, the 0-4-2 type is more suitable.

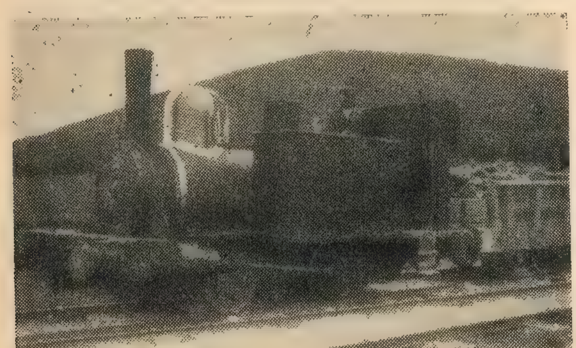


Fig. 3: *A* 3 *ft* 8 *in. gauge engine by S. Lewin, Poole,* 1875

If the object aimed at is a small compact engine there is little point in modelling certain of the larger types of narrow-gauge locomotives, such as the County Donegal 2-6-4 types or the Londonderry and Lough Swilly 4-8-0 types. Here nothing will be gained over a model of a standard gauge engine.

In the case of building a model of a 2 ft gauge engine to run on 3½ in. gauge of, say, 0-4-0 type then the scale will be 1¾ in. to 1 ft and the model quite small. Moreover, an 8 in. bore or so cylinder on the prototype will come out around 1⅛ in. to 1¼ in. bore —well within the capacity of a small lathe. At the same time the general arrangement of the engine, cab, etc., will be far more roomy and, thus, easier to handle, than that of a normal 3½ in. guage engine; all journals will be heavier, wheel treads wider, thus making for a far longer life.

Valve gear

For ease of repair, as well as for construction in the first instance, the Walschaerts gear is far more suitable than the Stephenson. Fig. 6 shows the layout of this gear on the 1 ft 11½ in. engines on the Vale of Rheidol Light Railway.

A very simple type of gear which found some use on narrow-gauge engines was the Hackworth gear; it was incorporated on a number of such engines built by Kerr Stuart and Company of Stoke-on-Trent, a firm which built a very large number of engines for the 600 mm. lines of the first world war. The company folded up in 1930, a victim of the world trade slump.

A point to be noted with this gear, however, as with Joy's, is that vertical movement on the driving axle will affect valve setting.

An adaptation of the Joy gear for use outside was made on certain narrow-gauge engines, notably the 4-4-0 type City of Cork class of the

Narrow-gauge locomotives . .

Fig. 5: Derelict locomotive by Andrew Barclay and Company

Cork and Muskerry Light Railway and the 0-4-2 type No 1 class of the Clogher Valley Railway, Ireland. In the latter case, the motion to the vibrating link was obtained by a small connecting or eccentric rod from a return crank arranged not unlike the Walschaerts gear.

One or two builders introduced gears of their own for narrow gauge work. Messrs W. G. Bagnall, of Stafford, made use of the Bagnall Price gear. Kitsons, of Leeds, the Kitson gear (mostly on 3 ft 6 in. tram locomotives) while Baugaley, of Stoke-on-Trent, used the gear of the same name.

It may be said that the most interesting and pretty narrow-gauge engines in use today—those small 2-4-0 Beyer Peacock tanks on the 3 ft Isle of Man Railway—make use of the Allan Straight link gear. They must be among the last locomotives still to use it.

Boilers

A good many builders, Lewin, of Poole, Bagnalls, of Stafford, Spence, of Dublin, etc., made extended use of the marine-type boiler, which had its first application in locomotive work as long ago as 1830, when it was applied to some engines built by the Neath Abbey Iron Works, South Wales. Later revived by John Ramsbottom on the LNWR at Crewe the boiler was applied to a narrow-gauge engine by Sir Arthur Heywood in 1875.

Heywood made use of it upon all the 15 in. gauge engines built by him at his Duffield Bank works. Nevertheless, after his death, when certain of these engines were used on the Eskdale Railway, they were very shy of steam. When the type was taken up by such firms as Bagnall for small locomotive work, however, there was one important point in which their boilers differed from those of Heywood.

In the case of the Duffield Bank engines, the boiler shell was rolled from a single sheet of plate and, in the case of Bagnalls and Spence engines, the boiler shell only was rolled from a single sheet and the fire-box sheet was rolled from another sheet of larger diameter.

Thus, while in Heywood's boilers the diameter right through was 2 ft 1 in. with a 1 ft $3\frac{1}{4}$ in. dia. fire-box the Bagnall boiler shell plate was rolled to a diameter, in some cases, of 2 ft and the fire-box wrapper plate was rolled to a diameter of 2 ft 6 in. and joined to the shell plate by an eccentric-flanged throat plate. It will be thus seen that a much greater steam space existed in the Bagnall boiler than in the Heywood type.

I have dealt with this because it has been suggested to me that this tpye of boiler is easier to make than the normal locomotive type, and perhaps if made according to the Bagnall pattern might give satisfaction. A point which should be stressed here, however, is that if this proposed boiler of marine pattern is to be made in copper and brazed or silver soldered, then the circular inner fire-box should be of heavier gauge plate than the shell.

The reason for this is that the shell plate will be in tension, the pressure tending to tear the metal apart. This is the best condition in which the metal is prepared to resist the stress.

In the case of the inner fire-box, however, the metal is in compression (that is, the pressure tends to collapse the box, the worst condition to resist the stress). A good rule would be for, say, a boiler to be made of $\frac{1}{8}$ in. copper on the shell plate, then the fire-box plate could be at least 5/32 in. for safety.

Some readers may be interested in a type of narrow-gauge boiler which I built some years ago in steel. This boiler was the subject of a patent by Mr Watt Boulton of Ashton-under-Lyne.

Removable tubes

This type had a plain circular shell and fire-box of launch or marine type, but the back plate and front-tube plates were bolted to angle rings fitted to the boiler. Thus, the whole inner fire-box and tube assembly could be withdrawn.

It must be noted, however, that the circular flue tube which formed the fire-box carried right through to the smokebox and a number of diagonal cross water tubes were fitted into it. I adopted it because, as it was a steel boiler, it could be taken down for inspection at any time. On test the boiler steamed well—perhaps better than a normal locomotive type, but later the engine was sold and further data cannot now be given.

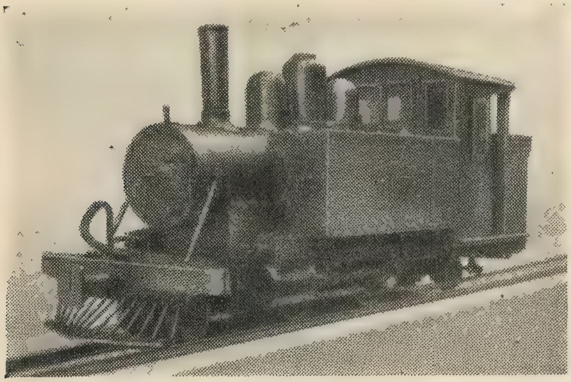


Fig. 7: A $2\frac{1}{2}$ in. gauge ($1\frac{1}{4}$ in. = 1 ft scale) model of Lynton and Barnstaple Railway's 2-4-2 LYN

Such a boiler would prove simple to make for those lacking the skill to produce the normal locomotive type, and if made in copper should be satisfactory, as very little brazing or other work would be required other than fitting the angle rings to the shell and the brazing in of the cross water tubes. However, it is my opinion that the normal locomotive type built of copper for boilers up to, say, 10 in. dia. cannot be beaten.

The saddle tank has, in the larger sizes, a tendency to be top heavy. It is not very easy to make, as compared with side tanks.

Certain narrow-gauge engines,

notably some by Borrows and Company of St Helens, Lancs., and Robey and Company, Lincoln, made use of a section of the main framing forward of the driving axle to serve as a tank with the added advantage that the front end was much stiffened. Of cabs little need be said, as in a good many cases they exist only as a weather sheet. The firm of Black Hawthorn, of Gateshead, on a number of their small engines, fitted a small square roof on heavy turned pillars—acting presumably on the supposition that the rain would always fall straight down.

Running gear

Wheel treads are always wider in proportion than those upon a standard-gauge engine. As an example, a normal 4 ft $8\frac{1}{2}$ in. gauge engine has wheel treads over flanges of $5\frac{1}{4}$ in. to $5\frac{1}{2}$ in. On certain 0-4-2 tank engines for 2 ft gauge built by the Hunslet Engine Company the wheel treads over flanges were $4\frac{1}{4}$ in. It will be seen that a wider tread will allow much for poor track work or track out of gauge.

In the 0-4-0 type it is my practice to increase the flange depth. In that case some form of weight fore or aft is sometimes called for to give a good distribution and avert as far as possible pitching or nosing. This, however, is more applicable in cases where the driver rides on the engine.

I would like now to mention the Lynton and Barnstaple Railway. This railway, a 1 ft $11\frac{1}{2}$ in. gauge line (19 miles long), was opened on 11 May 1898, starting service with three 2-6-2 tank engines built in 1897 by Manning Wardle, of Leeds. These three engines were outside cylindered and fitted with Joy gear.

When the line was taken over by the Southern Railway in 1923 a fourth engine of the same class was supplied by Manning Wardle. These four 2-6-2 tanks were named after local rivers—*Yeo*, *Exe*, *Taw* and *Lew*.

The engine (subject of a model shown in Fig. 7), was obtained from the American firm of Baldwins in 1900, as at that time no British firm could undertake a quick delivery. It was of typical American design with bar frames, the main dimensions being: cylinders 10 in. × 16 in.; coupled wheels 2 ft 9 in.; working pressure 180 lb.; weight 20 ton 10 cwt. (This model passed from my hands many years ago and the exact dimensions of the model are forgotten.)

Turning to Fig. 8 this shows an engine which was completed last year. It is not a scale model, but for a basis of design it was desired to produce to a scale of 6 in. to 1 ft a model of an 18 in. gauge engine.

The whole of the undergear, frames, and valve gear, are copied from the 18 in. gauge engines built by Hunslet Engine Company for the Sand Hutton Light Railway, Yorks. These engines, which did not turn up at Sand Hutton until about 1923, were built in 1917 for war service. They were divided into two classes: the Lord Raglan and Culverin.

In the case of the engine shown the rail gauge comes out at 9 in.; to keep it standard it is $9\frac{1}{2}$ in. The main dimensions being: cylinders $2\frac{1}{2}$ in. bore × 4 in. stroke; coupled wheels 11 in. dia.; coupled wheelbase 16 in.; length over buffer faces 6 ft.; width 2 ft 4 in.; height to top of chimney 3 ft 6 in.

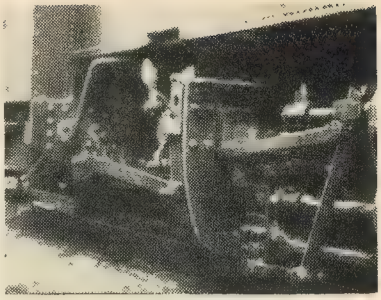


Fig. 6: Layout of valve gear on 1 ft $11\frac{1}{2}$ in. gauge engine

The time taken to build this engine was divided into two periods of three months each, or a total of six months' spare time, which would average about 10 to 12 hours per week. Total cost, including a job lot of copper for the boiler, about £15.

It must, however, be admitted that such an engine is beyond the scope of most home craftsmen—one pair of wheels mounted on the axle weigh 76 lb., for example. Such an engine, however, one third the size or, say, in $3\frac{1}{2}$ in. gauge would be well within the scope of many model engineers. ▣

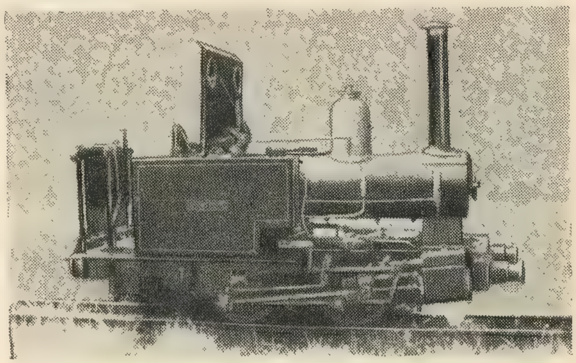


Fig. 8: An unscaled model of LLYN CAE, *which was completed last year*

LITHIUM BASE GREASES

A NEW development in their well-known range of lithium base greases, based on Lithium 12 Hydroxy Stearate, is announced by Shell-Mex and B.P.

Lithium base greases of this type have outstanding mechanical stability and can be used in a great variety of applications, particularly ball and roller bearings, over a wide temperature range, replacing numerous conventional greases often used in the industrial and marine fields. Long shelf-life and resistance to drying out and hardening in service are special features of these greases. They also possess good resistance to water.

Ship modellers are well aware, however, that there are many instances where water can gain access to bearings in service, and most greases offer little protection in these circumstances. Lithium base greases of the Shell Alvania range now contain a powerful water soluble corrosion inhibitor which confers anti-corrosion properties under these arduous conditions.

This is one of the advantages achieved in the more recent research and development work carried out by Shell Research, at Thornton Research Centre, on greases of this type.

Other advantages include even greater oxidation stability under both dynamic and static conditions than has been achieved hitherto, resulting in the service life of a charge of grease often being extended. ▣

CLUB DAY AT BRIGHOUSE

REPORTED BY NORTHERNER

Left: Leicester society loco driven by G. Sale

TWENTY-FIVE clubs in counties ranging from London to Sunderland were represented at the season's first Club Day at Brighouse, Yorks, recently.

The Leicester society had brought its club locomotive which is an 0-4-2 saddle tank in 1 in. scale. Originally, it had side tanks, but these were removed because they made the inside motion inaccessible—the latter, by the way, is Stephenson gear with the valves under the cylinders. Piloted by G. Sale, the engine worked well with a good load.

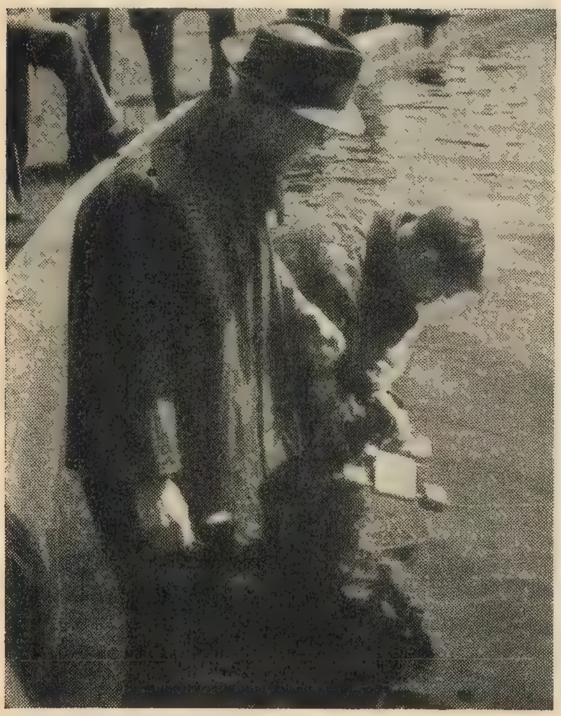
P. T. Atkinson, of Sunderland, had his $3\frac{1}{2}$ in. gauge NER 0-8-0 on the track, too. This engine was started about ten years ago from official drawings, and is still not quite complete. In fact, the tender was a borrowed one! The locomotive is similar in appearance to LBSC's *Netta*, but has the large boiler, as fitted to a number of the big sisters.

Mr Atkinson relies solely on a Linden injector to feed this boiler: there is neither mechanical nor hand pump, but he has never been let down.

Another Sunderland locomotive was the LNER Class L1 2-6-4 tank, built in $\frac{3}{4}$ in. scale by N. J. Mellentin to GA drawings by Clarkson, with cylinder and wheel castings from the same firm. This, too, was a handsome and well-built engine, and it certainly performed as well as it promised.

A 5 in. gauge *Netta* was also going well; she was "built to the words and music" (but with minor modifications) by Donald English, who hails from the Whitefield, Lancs, club. Except for the wheels, Don had made all the castings in his own home foundry.

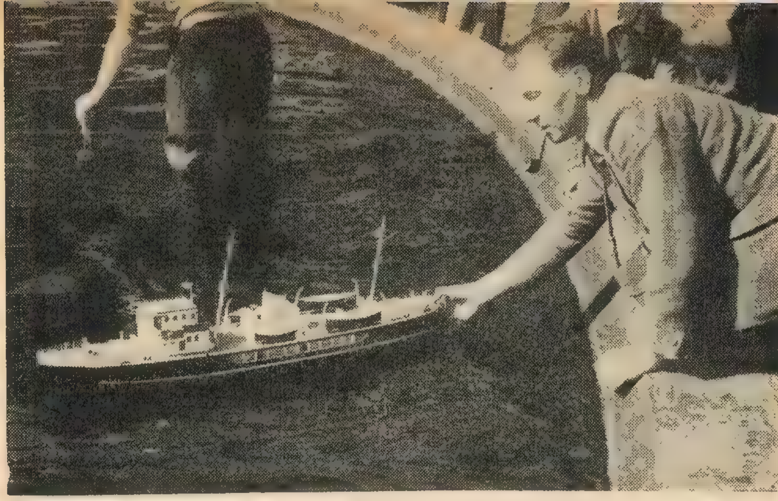
While these and many other locomotives were taking turns on the raised track, Jack Stubbs, of Wakefield, was trying out his $7\frac{1}{4}$ in. gauge 0-4-0 saddle tank on the ground-level track. It was difficult to believe that this was the engine's first time on the track; she ran smoothly and well, pulling an enormous load with ease. Jack said he had incorporated some of his own ideas with those of



Left: L. Oldfield launching his new hydroplane

Below: Wakefield member J. Stubbs driving his $7\frac{1}{4}$ in. gauge engine on its trial trip

With monitor working, Bill Ogden's firefloat cruises quietly along



The fibre-glass hulled Trinity House cutter is launched by its builder, A. G. Bottomley

the designer, Mallaby of Leeds, who had also supplied the castings.

Meantime, on the lake, one of the boats most admired was the firefloat built by Bill Ogden, of Oldham, which I have described on previous occasions. A. G. Bottomley, of the home club, was sailing his Trinity House pilot cutter *Pathfinder* . . . there is no doubt she will be a beautiful job when completed. The hull is built with strakes on plywood bulkheads, covered with cartridge paper and then with fibre glass. The boat is electrically-propelled and is to be radio-controlled.

Les Oldfield, of Huddersfield, made all heads turn when running his hydroplanes round the pole, the crackle of the exhaust attracting a large crowd. Both boats ran well though there was an unfortunate incident when someone inadvertently launched another vessel at the same time. The resulting crash was deafening, and pieces of superstructure flew high in the air. Surprisingly enough, the hydroplane appeared undamaged —she was batting round again within a few minutes—and the damage to the other boat did not seem to be too extensive.

The show was really stolen, however, by a freelance motor gunboat built by A. D. Bailey of the Tyneside group of the IRCMS. Based in outline on the gas-turbined HMS *Grey Goose*, the hull appeared to be packed with radio equipment. A small engine room contained a 5 c.c. engine with centrifugal clutch for high speed, and an electric motor coupled to the same shaft for cruising. At high speed the motor became a dynamo to recharge the batteries.

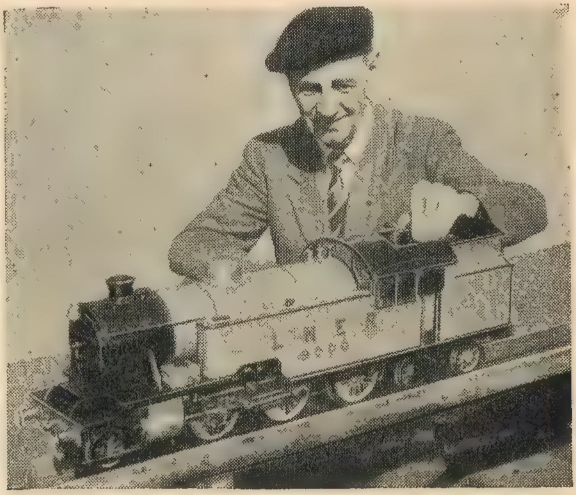
Towards the stern, this futuristic vessel carried a rocket on a ramp. When the boat reached the middle of the lake, it was uncanny seeing the ramp raise itself and the rocket, and then to watch the latter discharge itself and disappear over the trees.

Another radio-control feature of this boat was the depth charge apparatus. Each charge was effectively lobbed, and a moment after disappearing under water exploded with a satisfying thud and a shower of spray !

The rockets were made from aluminium foil, with turned wooden nose-caps and propelled by ordinary fireworks rockets, while the depth charges were " Little Demons " suitably disguised.

Mr Bailey told me he next intends to fit a 7 in. dinghy, which will be capable of being launched from the parent craft and then separately controlled under its own power. Whatever will they get up to next, as one elderly lady was heard to remark ! ■

The rocket-firing motor gunboat built by A. D. Bailey



N. J. Mellentin with his Class L1 2-6-4 tank engine

A two-inch BENCH MICROMETER

An instrument for close-tolerance work designed by
J. E. FOSTER

THE majority of modellers find, no doubt, that a 1 in. micrometer is sufficiently large enough for small work, but, if at any time they require a larger size, a special gauge—made of the plug or bar type for inside dimensions and a ring or plate type for outside dimensions—has to be resorted to.

I possess a 1 in. micrometer, but I have on several occasions wanted to measure between 1 in. and 2 in. I, therefore, decided to make a bench micrometer which can be used by hand if required. It is also useful for setting inside callipers from which outside callipers can be set, as it is difficult to do so accurately with a steel rule.

I first debated whether to screw the rod *C*, $\frac{1}{4}$ in. Whit. 20 t.p.i. and divide the index disc into 50 parts, or to screw the rod $\frac{1}{4}$ in. ME 40 t.p.i. and divide the disc into 25 parts. I decided on the former, which taps and dies I had, but did not possess the latter, although these would, I think, make a more accurate tool. Unfortunately, $\frac{1}{4}$ in. BSF has 26 t.p.i. which, if it was 25 t.p.i., would be ideal for this and other indexing purposes.

The body *A* is of cast-iron, the foot of which was first ground on a carborundum wheel to remove the hard skin, and then filed flat and square with the vertical centre line. The bosses to receive the rods *B* and *C* were centred and drilled by a Slocombe drill, and then faced on the outside between centres in the lathe. The boss for rod *B* was drilled and reamered $\frac{3}{8}$ in. dia., and the boss for rod *C* was drilled No 10 for $\frac{1}{4}$ in. tapping; for accuracy in alignment they should not be drilled between centres.

The body was initially put between centres while the foot was clamped in the tool post. The tail-stock and the saddle were then withdrawn, the three-jaw chuck with a 23/64 in. drill was placed on the headstock mandrel, and the tail-stock centre brought up to put on the feed and finally reamered $\frac{3}{8}$ in. dia.

The body was then reversed and the same procedure was adopted to drill the other boss No 10. A $\frac{1}{4}$ in. Whit. taper tap was inserted in the chuck, and turned by hand to obtain a true start of the thread; tapping was done in a vice in the usual way.

It will be observed from the end view that the 1 in. long head end has a projection shown dotted, which was necessary on the pattern to leave the sand. This was filed off, the 45 deg. face filed to take the index plate *H* and the inside face filed true to meet the locking nut *F*.

The index rod *C* is of m.s. bright bar which was selected for straightness. It was made $5\frac{3}{4}$ in. long, thus leaving the pintle, shown $\frac{3}{16}$ in. dia., $\frac{3}{8}$ in. long. This pintle was first turned 0.195 dia., which is equivalent to the maximum diameter the $\frac{1}{4}$ in. Whit. die would open to, thus forming a guide to keep the die-stock square with the rod when starting to cut the thread.

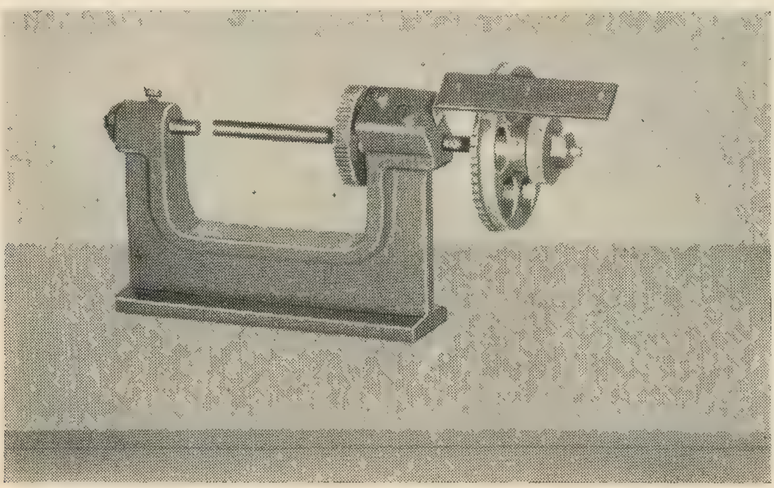
The better way would be leave the head of the rod longer for holding in the three-jaw and to cut the thread by a die holder fitted to the tailstock, but one was not available at the time. To produce an accurate thread for the whole length of the rod it might be advisable to first cut the thread in the lathe to, say, half or a little more of the full thread and then finish with the die.

The adjusting screw *B* was screwed in the same way as previously described.

The index *D* is of brass, turned and bored to the dimensions shown. The bore is slightly countersunk for riveting. The periphery of $2\frac{5}{16}$ in. dia. was divided into 50 parts by a dividing device, which consists of change gear wheels fitted to an expanding adaptor inserted in the hollow mandrel of the lathe headstock, which I made similar to that described in MODEL ENGINEER of 24 March 1949 by Duplex. The divisions were cut by placing a V-tool on its side in the tool post and moving the saddle along the lathe bed at each cut.

The turning screw *E* is of brass, and was lightly driven into the disc *D* and riveted. The locking nut *F* is also of brass.

The bush *G* is of brass, and its object is to allow the rod *C* to be inserted and withdrawn. The index plate *H* is of brass sheet bent, drilled and divided in tenths of an inch to the dimensions shown, and fixed to the body by two 4 BA cheese-headed screws. (It will be seen that two turns

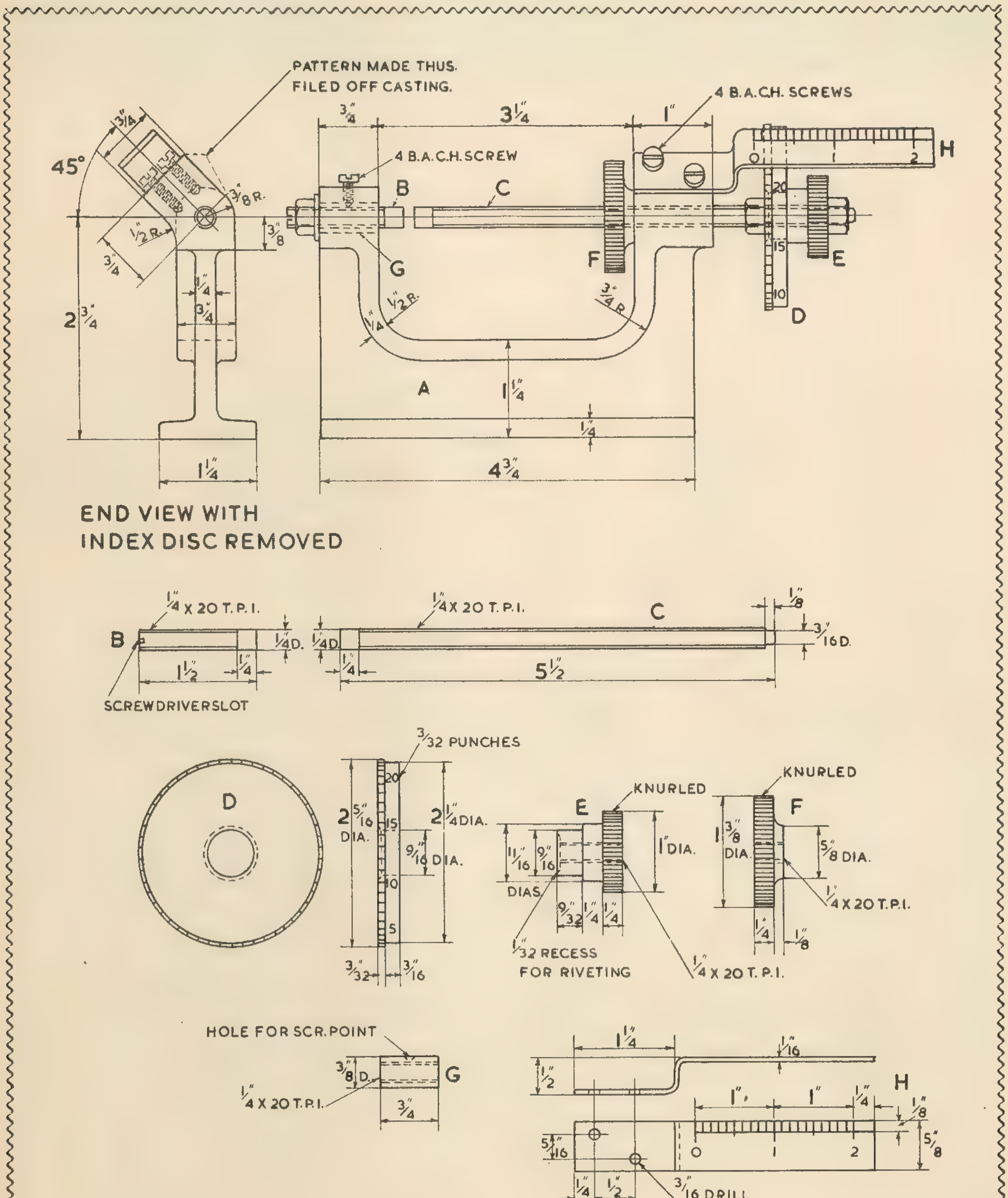


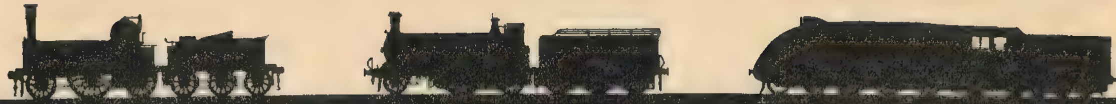
The completed bench micrometer

of the index disc is equivalent to 1/10 in.)

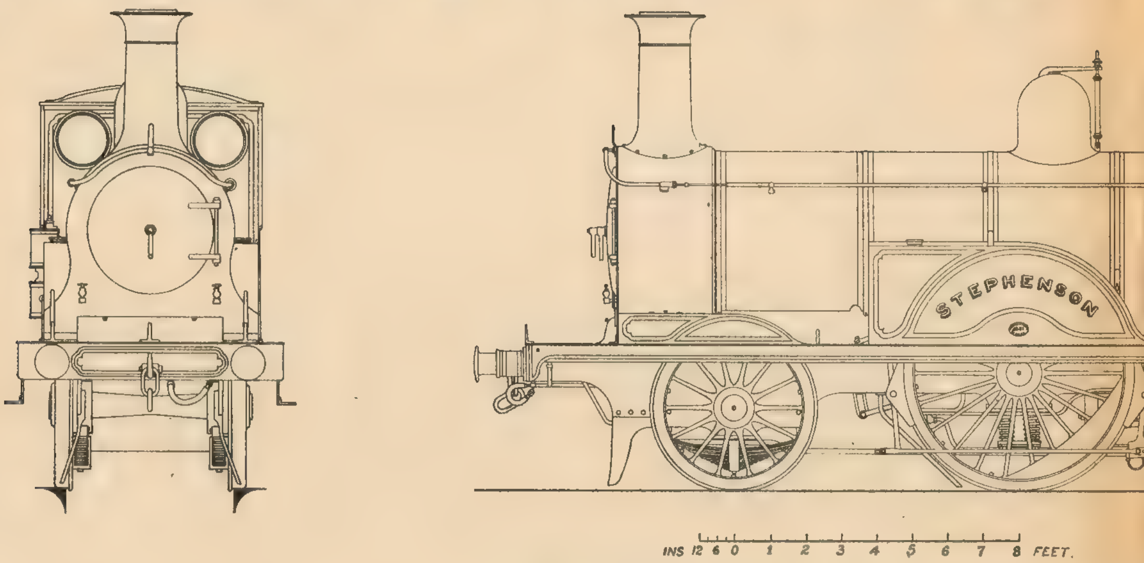
I may say that the accuracy is better than I had anticipated for a course thread of 20 per in., it being two thou large from 0 to 2 in.

In conclusion, if any reader wishes to make this tool I will be pleased to lend him my wood pattern. ■





LOCOMOTIVES I HAVE KNOWN



No 37 by J. N. Maskelyne — LB

With this third and last article on the Stroudley singlewheelers, I come to the G class proper. It seems that Stroudley, after trials with the big, imposing *Grosvenor* and the small, but altogether delightful *Abergavenny*, decided that there was plenty of scope for singlewheelers on the LBSCR, but that the best design would be a compromise between classes B and F.

Consequently, in December 1880 engine No 327, *Imberhorne*, was put to work; she was the first of the 24 jolly little sisters which comprised the original Class G. I knew them all, in spite of the fact that some of them seldom, if ever, worked trains through Wandsworth Common, which made them difficult to " cop." Perhaps the one which, in course of years, I came to know best was No 329, *Stephenson*; and, in any event, she outlasted all the others.

No 345, *Plumpton*, is the prototype of an experimental 7 mm. scale model that I built in 1933, to test the possibilities of exact-scale wheels. I chose her because I have memories of many runs behind her, and also because—breathe it gently !—her name seemed to be about the easiest of all of them to reproduce in 7 mm. scale !

In their early years, the G class engines were stationed at New Cross, Battersea, Brighton and Portsmouth, being fairly evenly distributed between the four depots; and they were set to work main-line services over the principal routes. They did well; in fact, on the London-Portsmouth line they did extremely well, in view of the trying gradients encountered on that line.

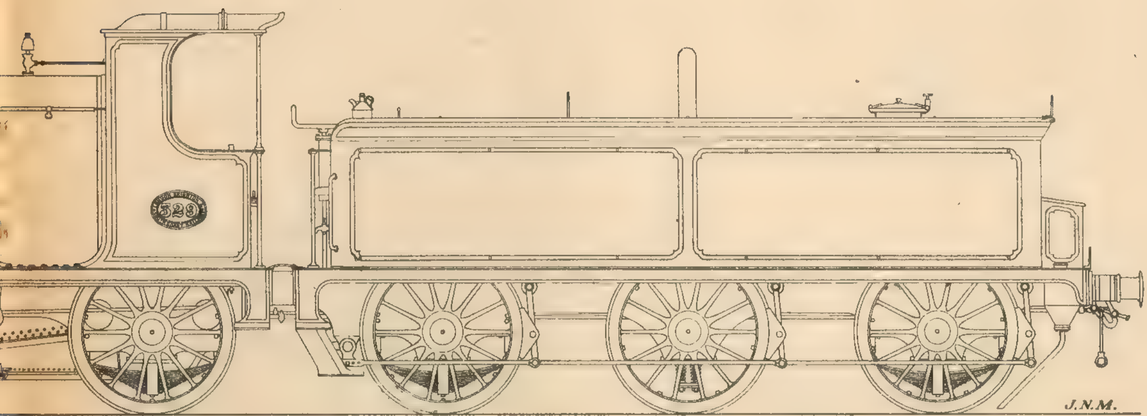
The timetables, however, did not then demand average speeds of more than about 40 m.p.h., but the trains were not of the lightest, so that the work required was of a high standard. To see these engines at their best, one had to go to a place like Forest Hill, a station at the top of 2¾ miles of 1-in-100 gradient that begins only about 2¾ miles from the point of departure (London Bridge).

To see a G class engine hauling a long trail of assorted coaches, four-wheeled, six-wheeled and eight-wheeled, resolutely topping that bank was to realise that those Stroudley singles had something which some other singles had not got. True, at the top of the Forest Hill bank, their speed was often down to around 20 m.p.h.; but once over the top, they were away.

It was apparent that, although these engines, like all singles, often indulged in a good deal of slipping when starting, they had a very firm grip on the road when running; and it stood them in good stead on the Portsmouth line with that Ockley bank and other rather testing gradients to negotiate.

When I came to know the G class really well, they had mostly given way to larger and more powerful types on the best main line trains; but there was a great deal of secondary passenger traffic between London and the south coast on which these engines gave satisfactory service for several years. Semi-fast trains to and from Tunbridge Wells were frequently worked by these engines, and between 1909 and 1912, I enjoyed many runs with No 342, *St Lawrence*, 345 *Plumpton* and 329, *Stephenson*.

The first two of these were then stationed at Tunbridge Wells, while *Stephenson*, then renumbered 329-A, was a Battersea engine, and had an



SCR 2-2-2 No 329 "Stephenson"

interesting turn; for she regularly ran the 6.3 p.m. on Fridays only, from Victoria to Tunbridge Wells and returned on the 8.25 p.m. from the latter town. I found out that the reason for this was to make sure that she was in proper trim for working the Eastbourne Pullman Limited on Sundays, a duty for which she was specially reserved, in summer months only, until 1912.

I was travelling to London daily from Edenbridge then, and, needless to say, always went home by the 6.3 p.m. from Victoria on Fridays, so as to enjoy a run behind *Stephenson*! She never failed; though one evening, during a terrific thunderstorm, she very nearly stuck in the deep cutting between Woldingham and the Oxted tunnel, but recovered herself just in time to prevent a stall.

On the Eastbourne Pullman she was well known, and ran her last trip on it in September, 1912. After that, she was kept as a sort of odd-job engine at Battersea sheds, pottering about on any job that offered itself, until May 1914, when she, the last survivor of her class, was withdrawn for scrap, still with her *original* boiler, then 33 years old.

I have already mentioned some runs I had behind either No 342, *St Lawrence* or No 345, *Plumpton*. These two engines were then taking it in turns to work a fast morning train from Tunbridge Wells to London; it left Edenbridge Town at 11.25 a.m., and, stopping at Oxted and East Croydon only, was due at Victoria at 12.8 p.m. I was learning engineering at King's College at that time, and on Wednesdays had no lecture to attend before 2.0 p.m. So the 11.25 a.m. ex-Edenbridge was my normal train on that day, though a later one would have sufficed!

Either of the two singles timed that train without trouble, and I always enjoyed the trip. The load was made up in the following order: one six-wheeled van, one eight-wheeled third, one six-wheeled first, one eight-wheeled third, two six-wheeled vans with another eight-wheeled third bringing up the rear; the tare weight would be about 125 tons, and the gross about 140 tons. This was a comfortable load for a single, and there was never any trouble in working it. But the chief excitement of the trip usually occurred on the run down from Woldingham to Sanderstead, where speed would often rise into the seventies.

The dimensions of these engines were: cylinders, 17 in. dia., 24 in. stroke and 26 in. apart; they were horizontal and with the steam chest between them; the valves were provided with $\frac{7}{8}$ in. steam lap and $\frac{1}{8}$ in. exhaust lap; the lead was $\frac{1}{16}$ in. and the full-gear travel was $3\frac{3}{4}$ in., the valve-gear being Stephenson's, with the weighshaft above.

The diameter of the leading and trailing wheels was 4 ft 6 in.; that of the driving wheels was 6 ft 6 in. The wheelbase was 15 ft 11 in. divided into 8 ft plus 7 ft 11 in., and the overhang was 5 ft $8\frac{1}{4}$ in. in front and 3 ft $3\frac{1}{4}$ in. at the back. The length of the frame plates was 24 ft $10\frac{1}{2}$ in. and their thickness $\frac{7}{8}$ in.; they were of steel.

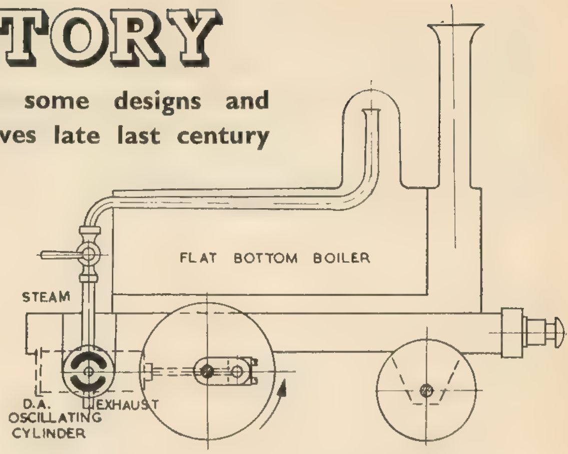
The boiler was made in three rings, the diameter of the largest being 4 ft 3 in., while the length of the barrel was 10 ft 2 in. and the centre line was pitched 7 ft $1\frac{7}{16}$ in. above rail level. There were 262 tubes of $1\frac{1}{2}$ in. dia., their heating surface being 1,084.51 sq. ft; the fire-box heating surface was 99.8 sq. ft, so that the total amounted to 1,184.31 sq. ft. The original working pressure was 140 p.s.i., but this was later increased to 150 p.s.i. In 1913, however, *Stephenson* was running with the pressure reduced to 120 p.s.i., due to the age of her boiler.

These engines weighed 33 tons 8 cwt and the tenders 27 tons 7 cwt. The driving wheels carried 13 tons 10 cwt, the leading wheels 12 tons, and the trailing 7 tons 18 cwt. The capacity of the tender was for 2 tons of coal and 2,250 gallons of water.

My old friend, the late E. L. Ahrons, had quite an affection for these engines, but he used to say that all the wheels being outside gave the engines the appearance of being "all legs," and when they were running they always reminded him of centipedes! I have often wondered what he would have thought and said about some modern engines. But, so far as I am concerned, it is enough that I knew all the Stroudley singles and found so much delight in their elegance and in their work. ■

ANCIENT HISTORY

LBSC recalls, comments on and criticises some designs and instructions offered to builders of locomotives late last century



The engine that could only run backwards

A CORRESPONDENT who enjoys reading the articles under the heading "Fifty Years Ago," which appear from time to time in this journal, suggests that it would be interesting to know what sort of instructions were available to locomotive builders at or before that period. He asks if I could cast memory back and relate a few examples. Other readers having suggested the same thing—as the old saw puts it: "great minds think alike." I will try to do something about it; so here goes.

The first instructions that I ever recollect reading were those published in the *Boys' Own Paper* somewhere around 1888/90, which is certainly going a long way back. The principal writer was a Mr Hobden. He described a simple locomotive with outside oscillating cylinders and a "pot" boiler, a larger engine with slide-valve cylinders and a boiler for burning charcoal, two or three odd boilers, and various components.

The first was virtually a copy of the glorified toys sold by opticians, instrument makers and "general dealer" stores. The instructions consisted merely of how to assemble purchased finished parts by aid of a soldering bit and a few hand tools. The engine, when completed, would have just about been able to move itself, and would not make enough steam to run continuously.

Task for schoolboys

The larger engine was a huge affair, and as far as I can recall, was a 2-4-0 somewhere about 6 in. gauge. How on earth the designer ever expected schoolboys to build it with the kind of tools available has puzzled me from that day to this! It would have required a fully equipped workshop with a 5 in. lathe, drilling machine, and a brazing forge; but the instructions just said bore cylinders, turn wheels and so on, without any hint of *how* to do the jobs.

Sheet copper 5/32 in. thick was specified for the boiler; can you imagine a schoolboy trying to bend or roll a big sheet of that thickness around a rainwater pipe to shape a boiler barrel of about 6 in. dia.? Or by putting it through his mum's mangle? Even if he had managed to form the plates and get the boiler assembled, he could never have brazed the joints, as a blacksmith's forge would have been needed. There was no oxy-acetylene equipment in those days.

The components were a scream. The pump had two tiny valves with unrestricted lift and plenty of room for airlocking, while the injector (one was actually specified) was illustrated by what appeared to be a drawing copied from an old Giffard type, without any dimensions. The instructions said open out the delivery cone with a "rimer"—size not stated.

Labour in vain

The designer was an optimist even if he was no locomotive engineer, for at the end of the "instructions" was a note adding that "boys will be delighted to watch its miniature action." It is a pretty safe bet that no locomotive was ever built to *those* instructions—not even by the designer himself!

The trouble with the "pot-boiler" engines in vogue in those days was that they would only work when the day was absolutely calm, for the least wind would blow the flames about and the boiler would not steam. Another article gave a design for a boiler which it was stated would overcome this trouble. The "remedy" was worse than the disease, and a glance at the reproduced drawing will show why.

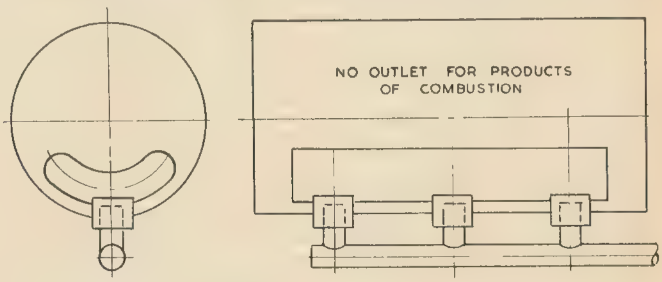
A sausage-shaped tube, closed at both ends, was fitted inside the boiler, and three short vertical tubes passed from the bottom of the barrel into the inside tube. The burners of the spirit lamp projected up into these, and the instructions said that as they were thus entirely enclosed they could not blow out. Naturally they couldn't, for the simple reason that they would go out as they were inserted, there being no outlet for the products of combustion!

Any poor industrious kiddy who tried to improve his engine by following the instructions would have had all his labour in vain.

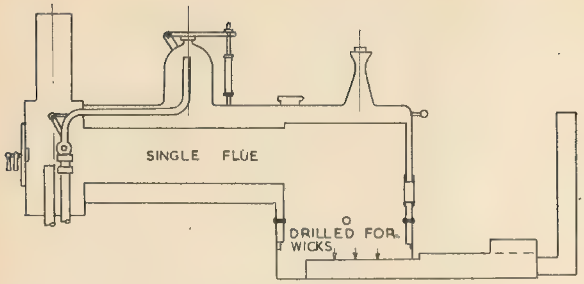
Backwards only!

Just after reading the BOP articles I found out that there was a shilling handbook on sale called *The Model Steam Engine; How to Buy, Use, and Construct it*, by A Steady Stoker, so I obtained a copy.

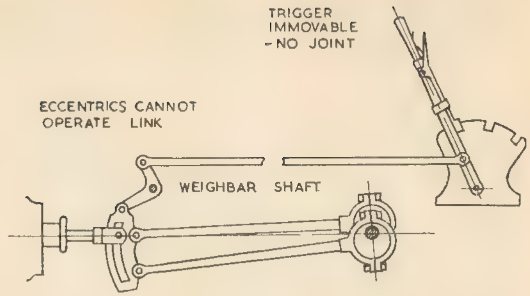
A coloured picture on the cover condemned it right away. This showed a single-wheeler of the 2-2-2 type with outside frames, and the very



An impracticable boiler design



The Alexander locomotive boiler



Mechanically impossible link motion

first glaring error I noticed was that the small leading and big driving wheels were shown connected by outside cranks with unequal throws, and coupling rods. It was impossible for them to turn.

Secondly there was a *red* headlight in the middle of the smoke box front, which had no door. Even a schoolchild knew better than that, so I thought that Steady Stoker's instructions would not be of much use; and so it proved.

After a brief " history " of the steam engine, he kicked off by describing candle bombs, little glass balls with some water inside and a spike formed on them which could be stuck into a candle beside the flame. When the heat from this boiled the water, the bomb went off and blew the candle out. Some steam engine, that !

Then he described four types of simple steam engines, each of which consisted of a plain vertical boiler without a flue, on top of which was mounted an oscillating cylinder with a flywheel. The stationary engines I had already made with tin-can boilers were far more realistic, so I soon passed that over. Incidentally, the illustrations showed steam coming out everywhere, blowing past the pistons through the vent holes in the cylinder covers, and escaping between the portblocks and faces.

After a wordy dissertation on various types of full-size steam engines, he started a description of how to make a horizontal engine with the following bit of encouragement, which I quote in full.

" This branch of the subject is beset with difficulties, the reasons for which are manifold; and when a few of them are stated, the youthful reader will see that the making of a model engine is a task that should not be undertaken without the conviction that the aspiring engineer possesses enough firmness of purpose to carry it through to the end, and thus avoid the imputation of tinkering."

As the job to which the above solemn warning applied merely consisted of drilling and tapping a few holes in a brass plate and erecting on it the cylinder, guides, bearings and flywheel, all of which he specified to be purchased finished, one is inclined to wonder what he would have thought of building, say, a 3½ in. gauge 4-6-2 from scratch !

Later in the book a locomotive is actually described and illustrated, with some rather vague instructions on putting it together. It is a four-wheeler of the 2-2-0 type, with a " bought-finished " pair of oscillating cylinders driving the rear wheels via a crank-axle, the cylinders being located under the footplate.

The really amusing part is the arrangement of the portblock. Only one is specified, the cylinders being held against it by trunnion screws in brackets attached to the outside frames. It is grooved on both sides, the upper grooves being connected to the boiler by a pipe with a plug cock in it, to act as regulator, and the exhaust from the bottom one is into the air underneath.

Real instructions

What Steady Stoker overlooked, and a proof that he didn't build one of the engines himself, is that with steam entering the top groove, the engine would go backwards ! As there was no reversing gear, this would literally be a drawback.

Another choice bit of instruction is that if, when fitting the wheels to the frames, the four do not bear equally on a level surface, the offending one should be turned down a little more. After reading the book I wished that I had spent my shilling at the metal merchants—I should certainly have got better value.

The first book that contained what might be called proper instructions that could easily be followed with success, was *Model Engine-making*, by J. Pocock, published in 1891. This author had originally written a series of articles in journals such as *The English Mechanic* and *Work*, which were beyond my ken at the time I read the BOP, so the Pocock book was a pleasant surprise. His description of how to make a horizontal engine was as different from those quoted above as chalk is from cheese.

No buying of finished parts and putting them together with a screwdriver and a soldering-bit, but more-or-less detailed instructions on how to set up castings for machining, and how to do the job. There were useful tips, too; for example, in those days self-centring chucks were an expensive luxury. Therefore, instead of Pocock writing, as I would, " chuck in the three-jaw," he advised readers who didn't possess one (they were the vast majority) to make a master chuck consisting of a gunmetal boss to screw on the mandrel nose, and to drill and tap it to a size suitable for the chucking-pieces on cylinder covers and similar components.

The chucking-pieces could then be threaded and screwed into the master chuck for turning, facing, drilling and so forth.

To set up cylinders for boring, he advised clamping the casting to the middle of the face plate by three dogs bearing on the flange, or screwing a piece of boxwood on the mandrel nose, turning a recess in it to take the cylinder flange, and holding it there by aid of three clamps secured by woodscrews.

He very properly stressed the necessity of setting the top slide true before boring, which was to be done with an " inside tool." He also described a gadget for boring cylinders from the tail-stock. This consisted of a bit of thin flat steel mounted in a beech or boxwood holder, which incidentally would be very useful even today for truing up the bore of a cylinder for which no suitable reamer was available.

For cylinder covers and other castings with no chucking-pieces, he advised screwing a flat piece of wood to the face plate and turning a recess in it into which the castings could be pressed while being faced off, drilled and tapped for glands, and so on. He also gave instructions for setting

up a crankshaft for turning the pin, by aid of blocks of metal attached at each end, with the crank pin centres drilled in them.

The Pocock locomotives

Two locomotives are described in the book. One is a simple four-wheeler with a "pot boiler" and outside single-acting oscillating cylinders; the other is a 2-4-0 designed by a long-defunct firm which had a shop in Hatton Garden, London. Pocock said it "will tax to the utmost the amateur's skill in fitting," but it wasn't as alarming as all that!

He gave a list of the castings supplied (price 28s. the lot!) and started by describing the boiler, which had a dry-back fire-box and six ⅜ in. tubes. The fire-box joints were riveted and soldered, but the smoke-box tubeplate was soldered only. As the tubes were to be beaded over and soldered at both ends, apparently this was considered sufficient to prevent the tubeplate from blowing out. Firing was by a six-wick spirit lamp, and the working pressure was not stated. The regulator was a plug cock inside the boiler, under the soldered-on dome.

A cast "bed plate" comprising frames, beams and running boards, carried the cylinders which were attached by two screws only. Link motion was specified, but friend Pocock was rather sparing with details of this; he did, however, describe how to make the expansion links by drilling holes along the marked-out slot and filing to the line.

He completely flopped on the reversing lever, which would not work if made as illustrated. The book concluded with a brief description of a vertical boiler, a marine boiler, and some rather ragtime fittings. Generally speaking, however, Pocock's book was really useful to anybody with the average amount of common sense and patience, and his advice and instructions were very good for the period.

Enter J. A. Alexander

In 1894—the advent of MODEL ENGINEER was not far away then—*Model Engine Construction*, by J. A. Alexander, made its appearance. This was a comprehensive volume comprising 322 pages with an insert of 25 sheets of working drawings, including four locomotives—two tender and two tank. Alexander advised the purchase of a 3½ in. bench lathe without back gear, slide rest or face plate, and illustrated it—complete with stand and treadle. He also included a short list of tools.

While much of his advice was good, he had some peculiar ideas of doing things. For example, he said don't buy ready-made screws, but make them. He suggested taking a piece of iron wire thicker than the required diameter, gripping it in a hand vice, opening the jaws of the bench vice a little way, resting the wire on them, filing it to a smaller diameter by turning it around when filing, then gripping the end in the bench vice and cutting a thread on the filed part with a screwplate; finally filing the head square.

For the nut, his suggestion was to cut a little square of brass, grip it in the bench vice, drill a hole through it with the hand-brace, and tap it with a tap held in the hand vice. The corners were then filed to make it octagon shape.

Fancy all that fallal when you have a lathe that will turn the screw blanks, and hexagon rod from which you can make both screws and nuts is freely obtainable at any metal merchants!

Alexander presupposed his readers' acquaintance with a friendly blacksmith who would do all sorts of small forging jobs on request. He also went to infinite pains to avoid undue friction. To that end he advised using 20-gauge sheet brass for frames, with the ⅛ in. iron-wire axles running in plain drilled holes in them. How long they would run before becoming slack, wasn't stated!

To turn the driving wheels he suggested mounting them on a "temporary shaft" between centres. As the hole in the middle of each wheel was tapped ⅛ in. to screw on the axle, and the diameter of the wheels was 2⅞ in., it can easily be realised how much *that* suggestion was worth.

Tail-stock problem

The instructions for boring the cylinders was to get the blacksmith to make a cutter with four parallel edges, and harden and temper it. This was to be held in the tail-stock (J.A.A. doesn't say *how*) and fed through the cored hole in the casting by turning the hand wheel. If the bore was not smooth enough, a rose cutter was to be put through it.

The covers were to be centre punched on each side, and turned between centres, a strip of brass soldered to one side acting as carrier. As the hole for the piston rod had to be drilled by hand, then enlarged and tapped for the gland also by hand, it needed a straight eye and sound judgment to get them anywhere near the mark.

The link motion shown in the drawings was a mechanical impossibility, as can be seen from the reproduced drawing which is a copy of that in the book. Incidentally, on the engine which I built to that design I connected the lifting arms to the pins in the lower eccentric forks by a pair of lifting links, and that, of course, allowed the links to operate.

Sheet brass of 20 gauge is specified for the links and, with a plain round pin working in the ⅛ in. slot, one can easily imagine how long the valve gear would remain accurate. The reversing lever and quadrant was another non-workable arrangement if made as shown. I made mine the same as those on the LBSCR engines.

One thing to be said in favour of the Alexander boilers was that they were good steamers, far in advance of the "pot" and "semi-pot" boilers commonly specified at that time. They were rather fragile, as the specification called for fire-boxes of 21-gauge sheet copper (Alexander said that this was the thinnest gauge that could be brazed) and barrels and wrappers of 24 gauge.

Low working pressure

The services of a coppersmith were advised to do the brazing, but it was stated that no riveting was needed to fix the fire-box-and-tube assembly into the shell, soldering being all that was necessary. The working pressure was 30 p.s.i., which was just as well, as there was one solitary stay, a plain copper rivet, specified for each side of the fire-box!

Spirits of wine, as J.A.A. called it, was used for firing. It was contained in a rectangular tin tank, a little smaller than the bottom of the fire-box; a dozen or more small holes were drilled in the top and furnished with wicks, which made a quite respectable fire, although it needed continual replenishment through a vertical pipe at the back. It was very wasteful, as the lamp tank became hot enough to boil the spirit and much was lost in vapour.

The fittings were crude, the regulator being merely a plug cock in the tin smoke box, operated by a wire running from a handle on the backhead to the cock handle through a ⅛ in. tube between the backhead and smoke-box tubeplate. There was no pump or other means of filling the boiler while in steam, one charge of water lasting about 20 minutes. Neither was there a way of lubricating valves and pistons when running; merely a screw plug in either steam chest or cylinder cover by which a little oil could be put in before getting up steam.

Such were the instructions available to builders of little locomotives and other steam engines before this journal came into existence. There was a big step forward when it did, and better information became available. ▣

Do not forget the query coupon on the last page of this issue

READERS' QUERIES

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W1.

Boiler testing

I have for some time been carrying out some interesting experiments with O gauge steam locomotives. I find that boilers of thin gauge material are essential to rapid steaming and have, consequently, been using some brass boilers from former Bassett-Lowke models. I am using a working pressure of 22 p.s.i. and have tested one boiler hydraulically to destruction. It stood the surprisingly high pressure of 450 p.s.i., as measured by a reliable ex-RAF gauge, before giving at the seam.

Being troubled with furring of the boilers and consequent blocking of water gauge passages, etc., I have recently been using distilled water instead of tap water. I should like your confirmation that this will not lead to any corrosion of the brass-boiler shell. With such thin gauge material one cannot take risks.—RJR, Truro, Cornwall.

▲ *Small boilers—even when made of very thin material—are capable of standing up to extremely high pressures. This very high margin of safety, however, should be maintained as it allows for certain deterioration of the boiler in use, and also the possibility that workmanship in the boiler may not be of the highest possible standard.*

Incidentally, it was noted that you tested your boiler to destruction—no doubt done for purely experimental purposes—but for routine testing of boilers not more than 100 per cent overload is recommended as excessive pressure may weaken the structure of the boiler and make it more liable to failure afterwards.

Distilled water can confidently be recommended for any type of boiler, as it certainly will not increase risk of corrosion, and obviously the only way to avoid furring is by using water as pure as possible.

Steam plant for QM model

I am constructing a 63 in. model of the RMS *Queen Mary*, to be powered by a Stuart Double Ten steamed from a 4½ in. dia. double-flue boiler. My problems are:

1 The flue tubes are 1½ in. dia. and 9 in. in length, requiring a strong flame for heating but I wish to avoid using gasoline blowlamps if possible. Can you supply me with details of propane blowtorch and bottled gas equipment?

2 I wish to drive the boat with four screws of 1½ in. dia. and am in a quandary over gearing. Naval friends inform me that the r.p.m. of the screws for efficient drive without slip, etc., is in the order of 100-200 r.p.m. Thus a liner such as *Orcades* has a shaft speed of 180 r.p.m. max. Does this, however, remain true for a model like mine?

The model will eventually be fitted with radio control to give progressive rudder, speed from stop and reversing.—JB, Peckham, South London.

▲ 1 *Small containers for bottled gas and burners of the blowtorch type suitable for a model of this size are obtainable from Messrs Dex Industries Ltd, Wee-Dex Works, Edwin Road, Twickenham, Middlesex.*

2 *The effective speed of a propeller is the peripheral or linear speed of the blade, usually calculated at about two-thirds of the radius. It will be clear, therefore, that a small propeller must run at considerably higher speed than a large one to produce the same relative efficiency. A propeller of* 1½ *in. dia. running at a maximum shaft speed of* 180 *r.p.m. would have to have an impossible pitch angle to produce theoretical scale speed of the model, and it will thus be seen that direct coupling of propellers running at high speeds is quite in order.*

The only advantage of gearing down a propeller is that it enables a larger diameter and pitch of propeller to be used than would otherwise be possible.

Drawings for a dinghy

I would like to obtain a set of drawings for a hard chine sailing dinghy about 10 ft. long. Can you help me, please?—AML, Bearsden, Dunbartonshire.

▲ *The Yachting World cadet class of* 10 *ft* 6¾ *in. o/a by* 4 *ft* 2 *in. beam is the smallest and simplest boat of this type, with "Firefly."* 12 *ft* × 4 *ft* 7 *in., and the* 12 *ft national dinghy probably the most popular.*

You could get particulars and designs from the Yacht Racing Association, 54 *Victoria Street, London, SW*1, *or from Yachting World, Dorset House, Stamford Street, London, SE*1.

Lapping and honing

Can you tell me how to lap and hone the cylinders of a Stuart Turner Double Ten engine?—SGC, Forest Hill, London.

▲ *The two processes are quite distinct. Lapping can be done with a soft metal lap—copper or aluminium would be suitable—and an abrasive paste, the coarseness of which would depend on the amount of metal which would need to be removed, to produce a true surface. Valve grinding paste is suitable for coarse lapping and this could be followed by aluminium oxide or very fine flour emery. It is desirable to make an expanding lap so that the wear of the lap and the cylinder itself can be taken up. Several articles on laps of this type and lapping processes generally have been published in ME.*

Honing is done in a somewhat similar way but one or more abrasive stones are used, fitting in an expanding holder. This type of appliance can be obtained from Delapena Ltd, Russell Place, Cheltenham, Glos., in a suitable size for the Double Ten engine (¾ in dia.).

After the processes are completed, great care must be taken to remove all traces of abrasive by thorough washing in paraffin or petrol.

Colouring of Discovery

I would be grateful for any information concerning the colouring of the hull, above and below the waterline, and deck houses, spars and funnel of *Discovery*.—TLT, Warrington, Lancs.

▲ *Hull: black above and below waterline, with a white streak along the sheer.*

Bulwarks: white on the inside with black stanchions.

Fo'c'sle bulkhead: white.

Engine casing: white.

Aft companion way: white.

Boat skids and davits: white.

Fo'c'sle, rails, capstan and ventilators: white.

Anchors and bollards: black.

Chart and deck houses: mahogany coloured, probably varnished.

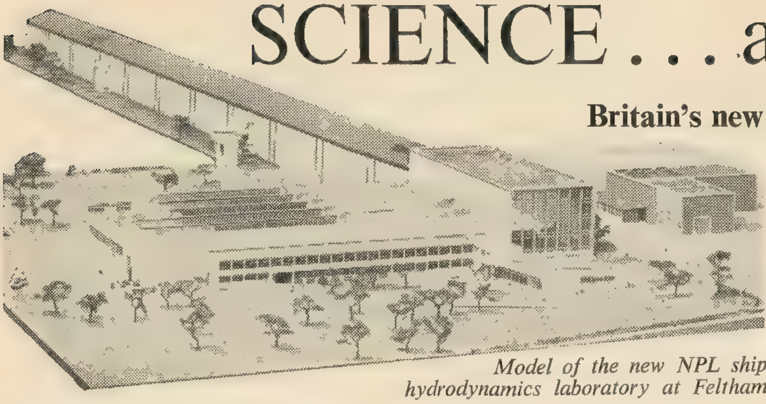
Masts and tops, bowsprit, funnels and ventilators on deck: buff or stone colour.

Mast caps and bowsprit caps: black.

Base of funnel and cowl: black.

Inside of ventilators: red.

SCIENCE . . . and SKILL



Britain's new scientific advances depend on the kind of careful craftsmanship demonstrated by the model engineer

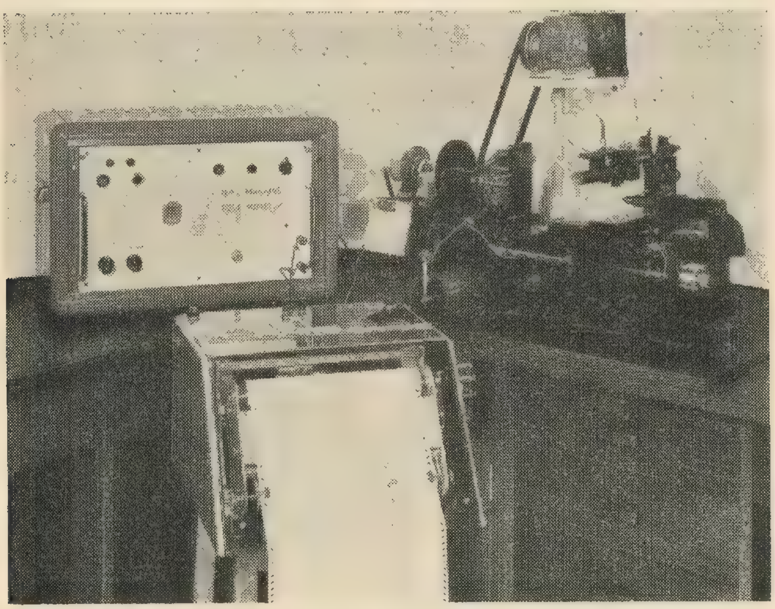
Model of the new NPL ship hydrodynamics laboratory at Feltham

For readers of these pages the most interesting discovery to be made at Britain's National Physical Laboratory—which has its physical existence at Teddington, near Hampton Court—is that the highly advanced sciences of today depend upon skill of the kind fostered by model engineering.

To a far greater degree than is generally realised, the distinctive achievements of mid-century science are made possible by new tools and materials. Scientists themselves, and certainly the younger ones, are not always as humbly conscious as they should be of the debt that they owe to developments which are essentially mechanical.

While it is true that some of these developments are the fruit of science, and in particular of chemistry and metallurgy, a debt none-the-less remains. Every branch of science owes something to the other branches and all of them together rely at some point upon pure engineering manipulation—the craftsmanship that brings tools and materials into creative union.

The headline-stealer at Teddington is the new high-speed automatic computing engine known as Ace, whose function will be the forecasting of weather. Given the observations which are normally plotted by hand on a synoptic chart, Ace draws its conclusions from them and issues its deliberations in the form of punched cards, translatable as forecasts.



Machine-tool monitor, showing a screw-cutting lathe working under the control of a diffraction grating

As one who had nearly six years of meteorology in the wartime RAF, I am now ready to believe anything. What makes Ace capable of performing this feat, of assessing the weather structure from a pattern of received data and then relating the structure to normal forecasting knowledge, is the possession of an electronic memory. Knowledge can be defined as remembered experience, and this machine has a capacity for storing information.

The same principle is found in another NPL computing engine, the Deuce. Both Deuce and Ace were developed from the Ace pilot model, a machine used continuously for four years on large-scale calculations for the Mathematics Division. Problems in mathematical physics, in crystallography, in linear algebra, in ballistics, in aircraft flutter—all these and many more are the ordinary day's work for Deuce. Indeed, as a change from these rather boring hack calculations, Deuce is glad to think out new techniques and is at present giving some of its attention to methods for solving partial differential equations.

Million a second

As many readers are no doubt aware, these computers operate on sequences of electrical pulses representing numbers in the binary scale: that is to say, numbers based on a notation of 2 instead of the usual 10. In Deuce the pulses are generated at a million a second and used in trains of 32, each equivalent to more than nine decimal digits; and for still greater precision larger trains can be set in action. The machine calculates at lightning speed. Addition takes a 30,000th part of a second, and though multiplication and divison are 60 times slower I doubt if the good-natured people at Teddington ever grumble about it.

The memory, the capacity for

storing numbers which the engine needs at very short notice, is created by a system of delay lines. These are steel tubes filled with mercury and having quartz crystals at each end. The pulse trains travel along them as ultrasonic compression waves.

Deuce has 12 delay lines each holding 1,024 digits, but a more extensive memory is provided by a " magnetic drum " store in which 1,024 digits are held on each of the 256 circumferential tracks of a rotating cylinder.

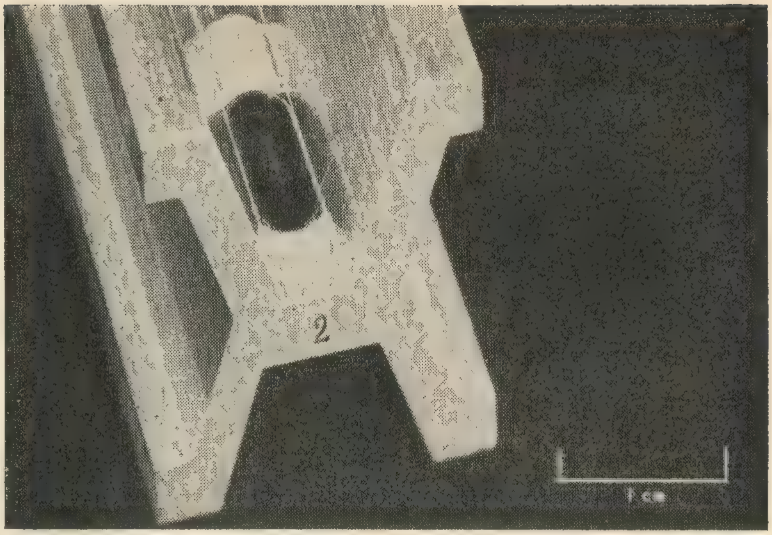
As Deuce does not have such a wonderful memory as Ace, and is also not so quick on the uptake, forecasting the weather will be left entirely to its brighter and younger brother. It will, however, be of interest to the reader in Britain that his own name may soon be flashing in binary-digit pulses through the complicated innards of Deuce, for there is a proposal to employ Deuce on sorting out the names of the 30,000,000 insured persons and beneficiaries in the National Insurance Index. Clerks being human and fallible, these names are often misquoted. . . .

Such, then, are Ace and Deuce. As creations, tools and symbols of science in our time, they naturally and rightly command our respect. Yet it was not advanced science alone that created them. They are products of skill as well as of brain.

Both Ace and Deuce are described as " engineered versions " of the pilot model. I am told that Ace was built with no fewer than two million soldered joints. There are, too, more than 50,000 soldered connections in the Differential Analyser, another machine used by the Mathematics Division.

In short, such machines could not exist without craftsmanship—and, what is of most interest to us here, craftsmanship of a kind that model engineering, more than other activity with the single possible exception of clockmaking, encourages and develops. Clockmaking is indeed so close to model engineering (as the pages of MODEL ENGINEER have shown of late) that one can hardly call it an exception. Allowing for the great variety of work to which the modeller's particular skill can attach itself, we may say that no craft gives a surer training in precision and patience, with the stimulus also of such interest and pleasure.

I emphasise the last point. Exact, minute, painstaking work of the type that modern science needs on its constructional side is, alas, prone to be dull unless the technician approaches it in the right imaginative attitude. Given a vision of the whole, he will value the part, however humble it be.



Top: *The British national copy of the metre*

Left: *Engineering skill. Building the new Ace*

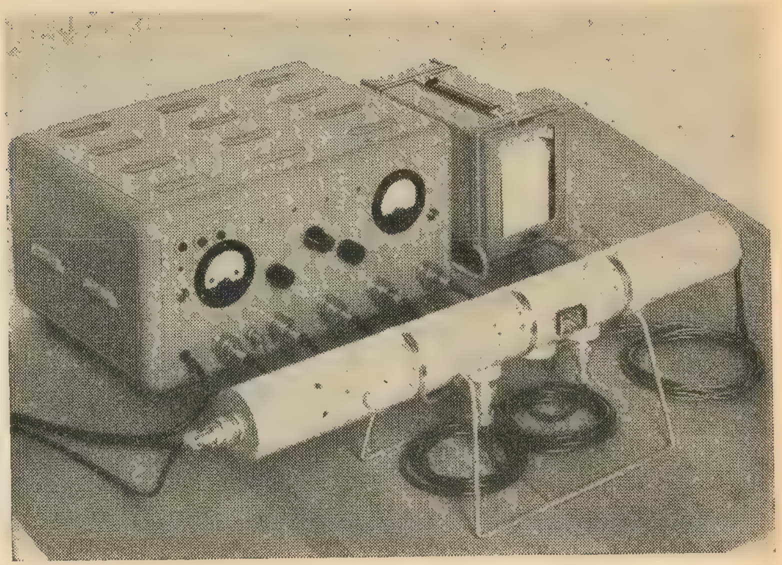
Machines of future

The problem of inculcating this attitude is important today and will be serious tomorrow. From the beginning of mass production in industry we have been dismally familiar with the man who, in return for a fairly comfortable existence, spends his days screwing Nut 61 to Bolt 60. In recent years the system has extended, notably to the lighter industries where women are often employed. Today more and more girls are smacking lids on to biscuit tins.

Yet all this is but a crude intimation of what the future holds. The great technological revolution now gathering speed is inspired and governed by science, and its tools are of the kind that science can be expected to devise—vastly elaborate machines not necessarily huge and often as comically small as the human brain. In atomic physics—and what is atomic physics but the liberation of the cosmic from

SCIENCE . . .
and SKILL

continued



Thickness, roundness, stickiness—there is a test for everything at the NPL. Here is the automatic recording saccharimeter, which, as its name denotes, measures the sweetness of sugar solutions

the microcosmic ?—vast sources of power are obedient to unbelievably intricate instruments.

These instruments can be built only by special skill, by the trained human hand. In an England without first-class craftsmen, Calder Hall would still be a blueprint.

These are the lessons to be learnt at Teddington.

Another wonder to be seen there is the new, more accurate version of the caesium atomic clock. Later in the year this instrument will be providing a time standard for the world correct over a brief period to within a few parts in 100,000 million. The existing clock, which is only a little less accurate, has been checking variations in the rate of the earth's daily rotation, and it seems from the vibrations of caesium atoms that the earth (I hope this will not worry anyone) was 0.035 sec. fast in June of last year and 0.035 sec. slow in October.

Not really simple

Here, again, in this atomic clock of which Britain should be proud, craftsmanship has converted theory into a machine. It is the same everywhere at Teddington. The simplest object that we are shown—the simplest in appearance—is the British national copy of the metre; but even this bar of platinum-iridium alloy did not come into existence by thought alone !

It is, in fact, discovered to be far from simple when one examines it. From 1889 until last year it represented the metre by the distance at 0 deg. C between two transverse lines ruled near the ends, but now it has been repolished and re-ruled with improved fiducial lines about 0.005 mm. (or 0.0002 in.) wide arranged in such a way that the metre length is represented at 20 deg. C as well as at the zero. Midway between the lines defining this new length reading, a further fiducial line was inscribed "to facilitate the direct measurement of the metre by optical interferometry in two steps of 50 cm. each"—a project which will be carried out with an interferometer "using a photoelectric microscope to observe impersonally the defining lines on the bar."

No model engineer could fail to be interested in the huge screw-cutting lathe which I saw working under the control of a diffraction grating. In this process, a short diffraction grating attached to the saddle moves over a long grating secured to the bed, and so produces moiré fringes, which are observed by a photocell, the signal from each fringe being converted to a pulse, which is used to sample the voltage from a potentiometer mounted on the spindle.

The gratings have the same pitch as the thread being cut, and, therefore, each rotation of the spindle should correspond exactly with the movement of one fringe over the photocell. Thus the sample voltage is a measure of the angle of the spindle at the instance that the pulse occurs, and if the angle, as shown on a paper recorder, changes at a constant rate the grating is seen to have a slightly different pitch from the thread. Random and cyclic changes show the errors in the lead-screw system of the lathe, and so the movement of the saddle can be measured to micro-inch accuracy. Feeding back the recorded errors through a simple servo-system makes the lathe the slave of the diffraction grating !

I will not harp upon the actual constructional work involved in making such a device as this. Let us see it as another example of the way in which science is served by manipulative skill, a faculty which has aided the advance of mankind ever since someone first sat on his hairy haunches and hacked at a flint.

JOSEPH MARTIN

ME PICTURE COMPETITION

THAT excellent picture you took of a model locomotive steaming round the club track—have you thought of entering it in our photographic competition ? You never know, it might win you £10 !

Pictures of any models, or aspects of model engineering, may be submitted, and, as intimated, they need not be specially taken. Have a hunt through those albums and old negatives; it might prove a profitable evening's occupation.

You can't remember the film you used or the exposure you gave ? Well, failure to supply those details will not debar you from entry; they are intended to be of academic interest to other photographers.

Neither will you be disqualified if you cannot recall the owner of the model, although this information is very desirable.

And remember, too, that even if you do not secure one of the three prizes your efforts may be rewarded by a reproduction fee of 10s. 6d.

Entry form and details are on page 70.

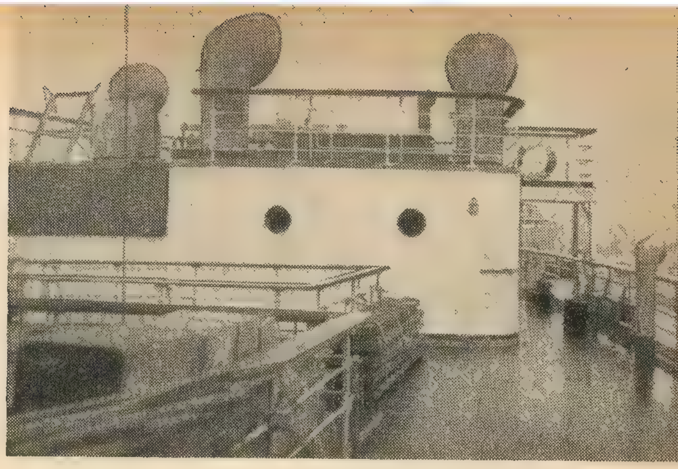
A WORKING MODEL OF

ST NINIAN

By EDWARD BOWNESS

Part 14—The fixing of the forward and after shelter decks and the making of the bollards and ventilators are detailed in this instalment

(*Continued from 27 June 1957, pages 934 to 936*)



Small and large cowl ventilators on St Ninian

In other designs, instead of a hinged plate across the cable there is a tumbler lever or finger hinged on a strong pin above the cable, which, when dropped on to the cable prevents its further movement. In both types the weight of the anchor locks the plate automatically.

The stoppers fitted on *St Ninian* will be seen in the close-up picture of the windlass and their general form is shown in Fig. 63 (June 27).

BOOBY HATCH

The booby hatch just forward of the windlass could be a dummy with a fixed cover, or could open into the fore hold so as to ventilate the space and dry it out should there be a suspicion that water had got inside at any time. In this case the cover should be flanged and could be held down against a sealing washer by means of a bolt secured to a bridge piece across a hole in the deck.

By the way, my drawing (Fig. 64, Part 13) showing the anchor windlass is twice the actual size for the model, *not* actual size as stated.

Having made the deck plate and fixed on it in their correct positions the fore hatch, windlass, booby hatch, cable stoppers and hawse pipes, you should now be ready to start the planking.

The laying of deck planking was discussed in part 7, April 4 and the remarks made there apply also to the fore deck. The covering board on each side is notched to receive the planks throughout its entire length, the short piece across the forward end being fitted between them. There are quite a few interruptions in the planking on this deck, and a large number of the planks are within the maximum length of 4 in.

However, there are a sufficient number of planks over 4 in. long for the pattern of the butts to be shown, as will be seen from a study of the full-size drawing of the fore deck in the Percival Marshall Plans Service.

In view of the size of the two large cowl ventilators—18 in.—I think it might be worth while to fit the framing around the base. The decision as to whether or not to fit them should depend on whether the holes for the even larger ventilators in the roof of the docking bridge (see part 7, April 4) were framed or not. One should at least try to be consistent.

SECURING THE DECK PLATES

Both the forward and the after deck plates should be secured to the stiffening angle by means of tiny brass screws, say 10 or 12 BA thread. The angle itself is too thin to take the thread, so a tiny piece of brass 16 or 18 s.w.g. and about $\frac{1}{4}$ in. square should be soldered under the angle where the screws come. If these squares are first tinned and then held up against the underside of the angle while a hot iron is applied on top, a joint will be made which will hold it during the drilling and tapping operations. The screws should be spaced about 2 in. apart.

Clearance holes should be drilled through the covering board and deck plate about $\frac{1}{16}$ in. from the edge, which will place the screws $\frac{1}{16}$ in. from the edge of the angle. The heads of the screws should be countersunk flush with the surface of the covering board. The tapping holes in the angles should be marked through from the deck plates. When fitting the deck plate it should be well luted with white lead to ensure a water-tight joint.

BOLLARDS AND FAIRLEADS

There are a number of bollards and fairleads about the decks and they could be grouped together as one job. Six pairs of fairleads are required for the forward shelter deck, and four for the after deck. Only two pairs of fairleads were shown on the drawing of the after deck (page 96, January 17, and page 424, March 21). The remaining two are located aft of them, the forward edge of the base-plate measuring 2.8 in. from the after edge of the fairleads already shown.

The two pairs in the bows have been described already (part 5, Fig. 24, March 7) and the remaining eight pairs should be made similarly. As shown in Fig. 65, the pegs are turned from $\frac{3}{16}$ in. brass rod and have stems 5/64 in. dia. They should be 5/32 in. high from the flange, and to allow for riveting, the stems should be $\frac{1}{8}$ in. long.

The base plate is of 20 s.w.g. brass 0.6 in. long × $\frac{1}{4}$ in. wide, and the centres of the pegs are 0.3 in. apart. They are mounted on little stools (Fig. 65). These are made of 18 s.w.g. brass sheet bent to an L shape, the inner edge being soldered to the stiffening angle and the outer to the top of the sheer strake. The base plate with the pegs must, of course, be riveted to the stools before fitting them in position.

As already mentioned when describing the after deck (part 6, March 21), the deck plates must be cut away to clear the stools for the fairleads, but not enough to lose the overlap for the water-seal with the stiffening angle. The four places where the forward deck plate is cut away are shown in Fig. 63 (June 27).

ROLLER FAIRLEADS

There are two special roller fairleads on the fore deck for use in connection with the warping drums on the windlass. They are designed to revolve freely on a central pin to reduce the wear on the ropes. Their position may be scaled from the plan (Fig. 63) and their general appearance is shown in the elevation. The enlarged drawing (Fig. 66) gives details of their construction, with the main dimensions. They are secured in position by means of a nut below the deck, which is screwed on to an extension of the pin on which the roller revolves.

ST NINIAN

continued

The length of the portion on which the roller runs must be sufficient to enable it to revolve freely.

THE MAIN BOLLARDS

In all there are 12 pairs of heavy bollards, six on the forward shelter deck and six on the after deck. Their positions are shown in the general arrangement drawing (part 2, January 17). Those on the fore deck are also shown in Fig. 63 (part 13, June 27). plate when sailing the model. They should, of course, be painted before fixing.

The wooden base of the windlass must be cemented to the deck plate. The bolts which hold down the windlass to the base board should be carried through the deck plate, the heads being below and the nuts on the bosses in the bed plate of the windlass. These bolts should not be larger than 14 BA.

THE SHIP'S BELL

The ship's bell on the fo'c'sle head is carried by a double stanchion secured to the deck just aft of the booby hatch. Further support is $\frac{3}{16}$ in. deep with a projecting portion $\frac{1}{16}$ in. dia. on top. This portion or peg is grooved to fit the wire, to which it is then soldered.

There is a tall stand for a swivelling deck light just aft of the windlass (see picture in part 13, June 27). This would, however, be a very delicate structure, very liable to damage, and could well be omitted in a working model.

Just forward of the hance of the bulwark on the starboard side a vertical plate will be seen standing out at right angles to the bulwark. This supports the jib of the crane on this deck when the vessel is at sea, the holes in the ends of the flat plate on

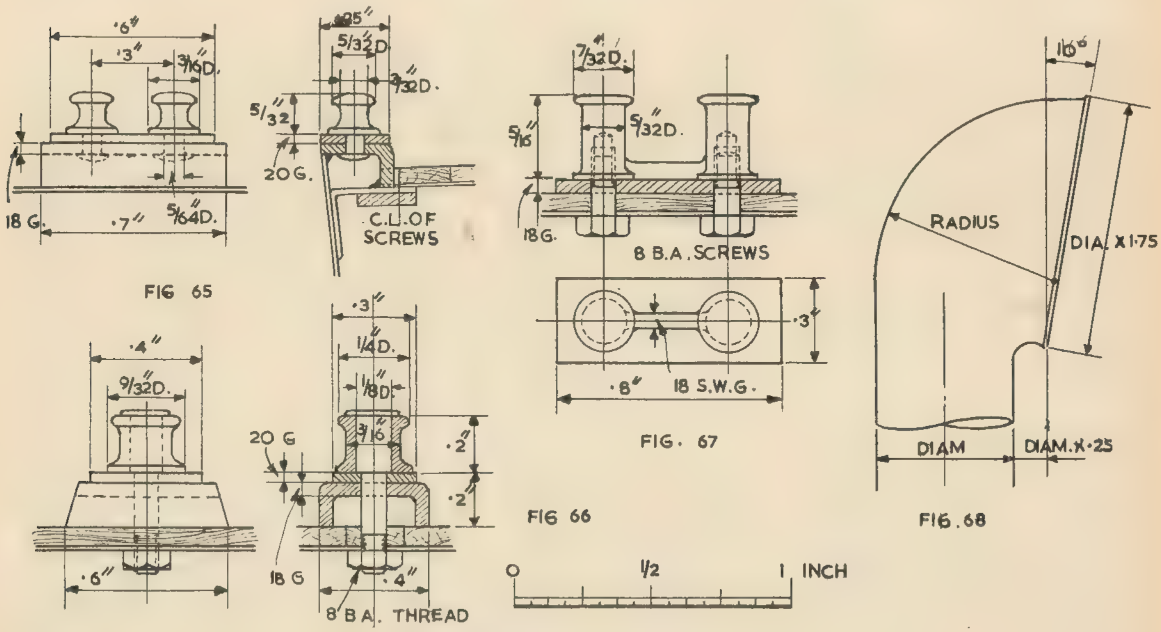


Fig. 65: *Fairleads at bulwarks*; *Fig.* 66: *Roller fairlead on forward shelter deck*; *Fig.* 67: *Heavy bollards on shelter deck*; *Fig.* 68: *Approximate proportions of large cowl ventilator*

Referring to Fig. 67, the pegs should be turned from brass bar 7/32 in. dia., being drilled and tapped in the lathe before parting off. The web between the pegs is made from 18 s.w.g. brass sheet as is also the base plate, which measures 0.8 in. long × 0.3 in. wide. When soldering, the pegs should be held in position by short screws with the web between them.

It is advisable to make a simple drilling jig for use when drilling the base plates. The same jig should be used when drilling the deck plates for the bollards. When fixing the bollards in position they should be cemented to the deck planking in addition to screwing them from below, as this will prevent water getting under the base given by two rods leading aft and fixed to the top of the stanchion, with their lower ends bolted to the two flat faces on top of the pedestals for the windlass shafts. This will be seen in the picture of the fo'c'sle head in my last instalment.

In the model the stanchion should be made from 18 s.w.g. brass wire. This is a little overscale, but anything less would be too frail. The ends must be cemented into holes drilled in the deck planking. The rods leading aft should be of slightly thinner wire soldered to the stanchion at the attachment of the bell, with their after ends flattened and soldered in position on the windlass (Fig. 63). The bell itself is turned from brass rod and is top being for the rope securing it. This should be left until the crane is fitted, so that it can be lined up correctly with the jib.

COWL VENTILATORS

The next consideration is how to make the cowl ventilators and how many of them should be shown. It may be possible to buy them. In recent years quite a variety of ventilators have become available and some of them are realistic. But for those who prefer to make their own, the well-known—but not sufficiently appreciated—method of making them by the deposition of copper by electrolytic action gives the best results.

Some builders have made ventilators by forming a cup in sheet brass or copper and soldering it on the top of a tube of suitable diameter, but the result is not entirely satisfactory.

In MODEL ENGINEER for March 7 Anthony Beaumont tells how he made ventilators for his cruiser by the deposition method, which, he says, was described in the journal in 1952. Perhaps he was thinking of the article by R. H. Mapplebeck on "Electro-forming Small Components," which appeared in ME for 22 July 1954. In this article the process was described in great detail.

Briefly, the method consists of carving a model of the required ventilator or other fitting in paraffin wax, making a plaster mould from this by melting out the wax when the plaster has set, and then casting the dummy for plating in the mould. The dummy is cast in lead, Wood's metal, Cerrobend or similar low-melting point metal.

The disadvantage where a quantity of each size is required, as in this case, is that a new wax pattern has to be made for each ventilator. It should, however, be possible to make a wooden pattern for each size, and to use it for as many dummies as one requires, making the plaster mould in two halves as in ordinary foundry practice. The dummy is then suspended in the plating bath.

Melt out the dummy

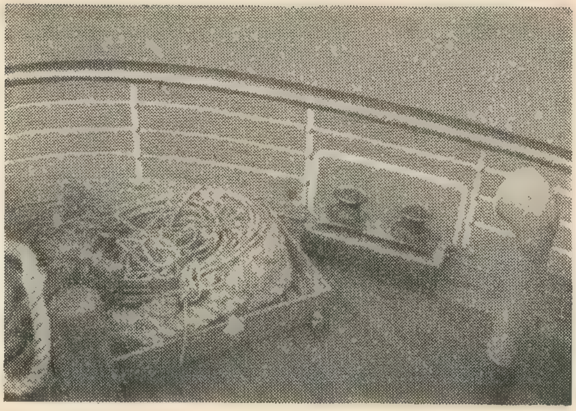
The thickness of copper deposited is roughly one thou per hour, but, of course, a number of dummies can be suspended in the bath simultaneously. When a sufficient thickness of copper has been deposited the dummy must be melted out, after which the ventilator can be cleaned up and polished as required. Any necessary flanges, handles and fittings can be soldered on afterwards.

Many ship modellers seem to have difficulty in getting the form of their ventilators correct. The cowl is often made bulging out at the back, whereas it invariably runs straight up and down (Fig. 68). The opening of the cowl may be vertical, but more often it slopes slightly forward: about 10 deg. would be reasonable. The diameter of the opening is about 1¾ times the diameter of the pipe.

It is usually circular in British ships. Continental builders often make the opening oval or pear shaped, and this form is often seen in modern British ships.

Handles are provided on each side just below the opening so that the cowl can be turned as required. The rotatable portion is painted white and the fixed pipe below it is usually painted black. The interior of the cowl is invariably painted red. A fine wire

At stern of St Ninian showing fairleads and stool, rope rack and 6 in. cowl ventilator



soldered around the edge of the opening of the cowl adds realism and will improve the appearance considerably.

The height of the more prominent ventilators can be taken from the drawings, and my pictures will form a guide in many instances. In most cases, the ventilators can be fixed by a screw from below, the bottom of the tube being plugged for that purpose.

The larger ones could be fitted into a hole in the deck and soldered on the underside. This would be convenient if the hole has been framed, as the deck planking would be cut away for the framing, and there would be no danger of the planks getting scorched. The frame would naturally be fitted after the ventilator is soldered in position. If the ventilators are mounted on short tubes in the deck with the cowls rotatable there should be some means of securing them when necessary. It is annoying to lose one—and ventilators, like lifeboats, seem to attract the attention of kleptomaniacs !

What to model ?

The decision of which ventilators to show and which to ignore depends largely on the ideas of the builder. Quite a number of the smaller ones are rather inconspicuous and would not add to the appearance of the model if they were shown. Others again are in awkward positions, where they would be liable to damage. This applies particularly to some of the smaller ones. The picture of the after deck house in this issue illustrates my point. The three large ventilators on the top of the deck house must be shown, but the small one on the right would be very exposed in the model and should be omitted.

Only the larger and more important ventilators have been shown in the drawings, but I will try to indicate the position of most if not all of them—at least of the cowl ventilators. On the after shelter deck there are four 6 in. ventilators, one on each side of the capstan and one on each side of the deck house, one 8 in. close to the superstructure on the port side, one 9 in. at the rail at the stern, another at the port side (see picture on page 425, March 21) and a 10 in. ventilator amidships, aft of No 2 hatch.

On the docking bridge there are three 25 in. ventilators as shown in the picture in this issue and in Fig. 35 (April 4), one 8 in. just aft of the compass, and two 6 in. forward.

On the forward shelter deck there are two 18 in. ventilators, as shown in Fig. 63, and two 9 in. (the canvas-covered pipes for which may be seen in the picture on page 352, March 7), one to port and the other right up in the bows.

There are ten cowl ventilators on the promenade decks, five 6 in., four 8 in. and one 9 in. These are placed close to the rail and, although the drawing specifies oval cowls, from the pictures some are certainly circular. Their postions may be seen in the pictures on page 707, May 16, the upper picture giving a very clear impression of the shape and proportions of the oval cowl.

On the wings of the bridge there is a 12 in. ventilator, port and starboard, and on the port side an additional one of 8 in. dia. (see picture on page 630, May 2). As will be seen these have oval cowls. Around the engine house gratings on the boat deck there are some very conspicuous ventilators. These are 21 in. dia. and have circular cowls. Their position and height may be taken from the general arrangement drawing (January 17).

Finally, there are no fewer than eight 6 in. cowl ventilators on the top of the wheel house, and one 9 in. As, however, the fittings on this deck have still to be detailed you can leave these for present. Some of them can be seen in the cover picture of the issue for February 7.

● *To be continued*

CROSS-SLIDE TOOL POSTS

By DUPLEX

APART from obtaining greater rigidity, dispensing with the lathe top slide and attaching the tool post directly to the cross slide often has the advantage of affording more convenient working conditions. In addition, this arrangement enables a number of tools and attachments, as well as workpieces, to be mounted in the lathe for carrying out a variety of machining operations.

The tool post illustrated in Fig. 1 was originally made as a top slide fitting to a large lathe for holding tools of the American pattern with deep shanks, and for this purpose one side of the mild-steel block was cut away and fitted with square-headed screws for clamping the tools in place.

The attachment was subsequently modified for use with the $3\frac{1}{2}$ in. Drummond lathe by fitting a central clamping bolt that also serves for holding the pressure plate carrying the jack screw.

CONSTRUCTION

For making the body *A* a $1\frac{1}{2}$ in. mild-steel offcut from a 3 in. square bar was used, but an iron casting would be equally suitable for the purpose.

Where a shaping machine is not available, the work should be gripped in the four-jaw chuck and all six sides machined to a good finish in the lathe. Filing a cast-iron workpiece of this size may be found tedious, and certainly the file teeth will be blunted in removing the hard surface scale, but a tungsten carbide tool used in either the lathe or the shaping machine will do the job quickly and accurately. In either case, the abutment surface on the under side of the body should be scraped flat with the aid of the surface plate.

While the body is still mounted in the lathe chuck, the hole for the central clamp bolt is drilled from the tail-stock by putting through a pilot drill before entering those of larger size. If a $\frac{1}{2}$ in. drill is the largest size available in the workshop, the hole should be finally opened to the clearing size with a small boring tool.

With regard to the drilling operation, it is usually best to bring the hole to the finished size by using a succession of drills, for when heavy drilling is undertaken from the tail-stock the drill chuck is liable to turn in the tail-stock barrel and may damage the taper; moreover, in some lathes the key that prevents rotation of the tail-stock barrel may also suffer damage.

To complete the work on the body it is drilled and tapped for the pad-screw *E*. Should the tool post be required for holding tools when mounted on the top slide of a lathe, the side of the block is cut away as shown and two $\frac{3}{8}$ in. BSF square-headed clamping screws are fitted.

The mention of scraping-in parts to the surface plate affords an opportunity of referring to a reliable make of marking compound, for this information has been sought by several correspondents.

The preparation used in the workshop is named Micrometer Brand Engineers' Marking and is supplied by H. Stuart, Sons and Co., Micrometer Works, Clevedon, Somerset.

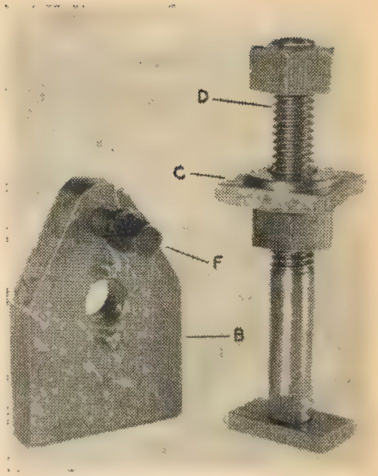
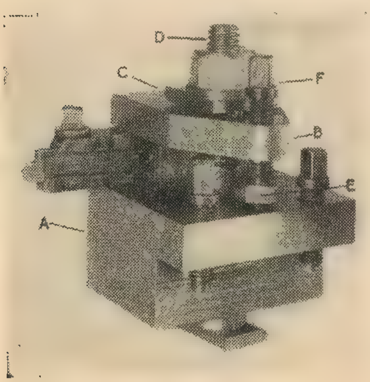


Fig. 5: The pressure plate and the clamp bolt

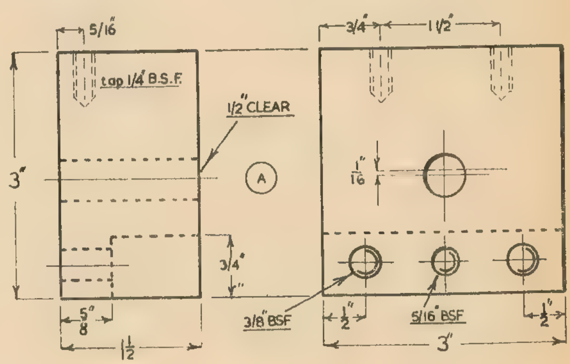
PRESSURE PLATE

This component *B* is cut to shape with hacksaw and file from $\frac{1}{2}$ in. flat mild steel, which is afterwards drilled $\frac{1}{2}$ in. clearing size for the passage of the central clamp bolt, as well as being tapped $\frac{3}{8}$ in. BSF for the jack screw *F*.

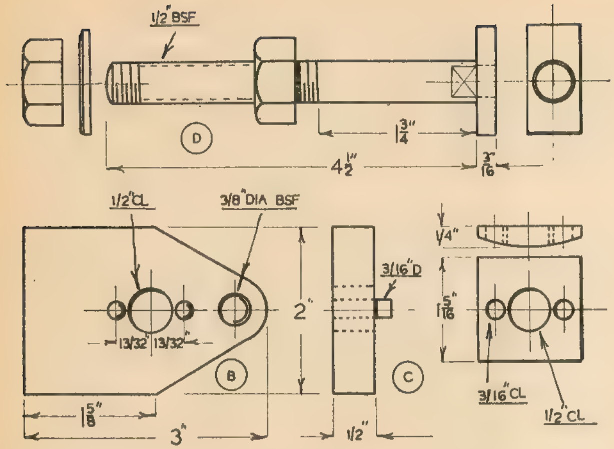
The curved rocking plate *C* is filed to shape from $\frac{1}{4}$ in. $\times$ 1 in. flat mild steel. The purpose of this component is to allow for any tilting of the pressure plate when the jack screw is tightened. The rocking plate is located on the pressure plate by means of two $\frac{3}{16}$ in. dia. silver-steel register pins. These pins are best fitted by drilling the two holes in the rocking plate with a No 13 drill before the curved surface is formed; the two plates are then secured together in position with a $\frac{1}{2}$ in. dia. bolt and the

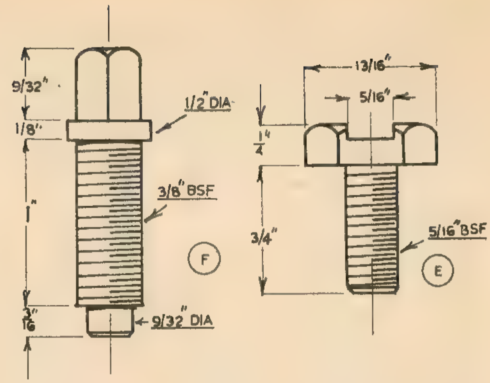


Left, Fig. 1: The cross-slide tool post. A *the body;* B *the pressure plate;* C *the rocking plate;* D *the clamp bolt;* E *the pad screw;* F *the jack screw*



Right, Fig. 2: The tool post body





Above, Fig. 4: The jack screw and the pad screw

Left, Fig. 3: The tool post clamping components

same drill is put right through both plates.

If the $\frac{3}{16}$ in. dia. register pins are slightly tapered at the ends, by rotating them in the drilling machine and applying a fine file, they can be pressed securely into place when pressure is applied in the bench vice.

To enable the pressure plate to tilt, the two holes in the rocking plate are enlarged with a No 12 drill.

JACK SCREW

After a length of $\frac{1}{2}$ in. dia. steel rod has been shouldered down in the lathe, it is threaded $\frac{3}{8}$ in. BSF and the end of the screw *F* is machined to a dog point.

After reversing the screw in the chuck, its end is reduced in diameter to equal the distance across the corners of the square head, and a flange is formed both for the sake of appearance and to locate a key spanner.

An easy method of forming square and hexagonal heads on screws was described in a previous article and need not be repeated, but this work can quite well be carried out in the lathe by milling or fly-cutting if a simple form of indexing the work can be arranged.

The pad screw *E* has a slot machined across its head to form a seating for the point of the jack screw. As they are subjected to considerable wear, both the pad screw and the jack screw should be case-hardened.

LONG T-BOLT

To save material the central clamping bolt *D* can be of built-up construction. The lower end of the $\frac{1}{2}$ in. dia. shank is shouldered down and threaded $\frac{3}{8}$ in. BSF.

The foot piece is also threaded and countersunk on the lower surface so that the end of the bolt can be riveted over after the two parts have been screwed firmly together. Two flats will have to be filed at the lower end of the bolt shank so that it can engage in the cross-slide T-slots.

The use of a long holding-down bolt is not always good practice for securing attachments to the lathe cross slide, but in the present instance the part of the bolt serving this purpose is only $1\frac{1}{2}$ in. in length under the nut.

When mounting a tool in the tool post, the lower nut is first firmly tightened to secure the body in place and the upper nut is afterwards adjusted to bring the pressure plate into a horizontal position when in contact with the shank of the lathe tool; finally, the tool is firmly held by tightening the jack screw.

GUIDE FENCE

The tool post, when mounted on the cross slide, has been found useful for machining a batch of parts to equal length by means of a milling cutter or fly cutter mounted in the lathe chuck. To locate the workpieces parallel with the lathe axis the fence illustrated is attached to the vertical side face of the tool-post body, and end-location of the material is provided by an adjustable work stop. The guide is secured in place by means of two $\frac{1}{4}$ in. BSF screws and the work stop illustrated is then bolted to the end of the guide bar.

● *To be continued*

Fig. 7: The guide fence

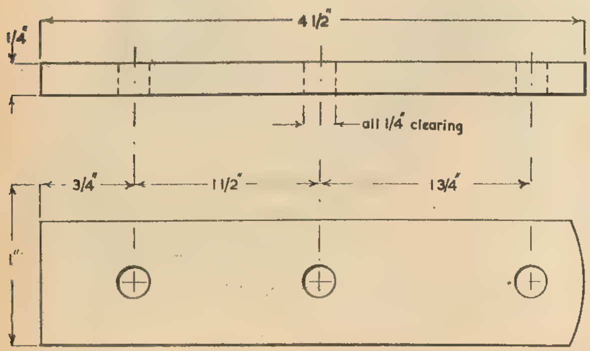
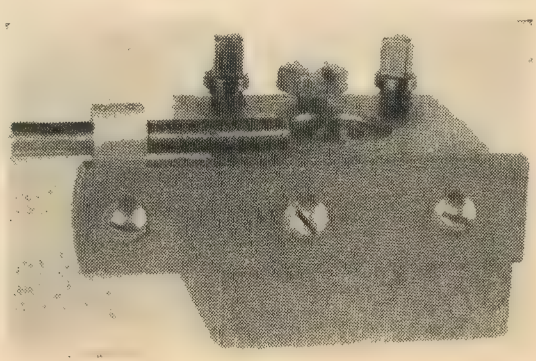


Fig. 6: The guide fence and work stop attached to the tool post



POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

CRIMEA RAILWAY

SIR,—The story of a locomotive intended for the Crimea being shipped to Australia [The World's Oldest Working Loco, June 13] recalls another story of the events which determined the gauge of the Argentine railways.

In 1854, E. B. Wilson built for an Indian company one 0-4-0T, which was hurriedly diverted to the Crimea when it was decided to construct a military railway there. The Balaclava line thus became 5 ft 6 in. gauge. After the war, the contractor for the first Argentine line bought this engine and took her to Buenos Aires, where she helped to make the line and hauled the first train on it. She was named *La Portena*, and is preserved in a museum.

The gauge of the Indian and Argentine railways is thus identical because of the accidental diversion of an Indian locomotive to the Crimea.

If both stories are true, there were either two gauges in the Crimea, or the Australian engine was altered to standard gauge.

Sevenoaks, Kent. S. V. PEYTON.

STEAM PLOUGHS

SIR,—On page 599 of the issue for April 25 are several photographs of ploughing engines.

I have often heard of this method of ploughing, and I am aware that the term " plough steel " for the best grade of flexible wire rope derives from this application, but I have never seen ploughing carried out in this fashion, and I have no idea how the plough is brought back and forth across the field.

Is a " deadman " anchored with a snatch-block on the far side of the field, so that the plough is pulled backwards to the starting point ? Or do two ploughing engines work in tandem, on opposite sides of the field, advancing each a furrow's width after each pass of the plough ?

Washington, DC. JOHN LYMAN.

CSL ENGINES

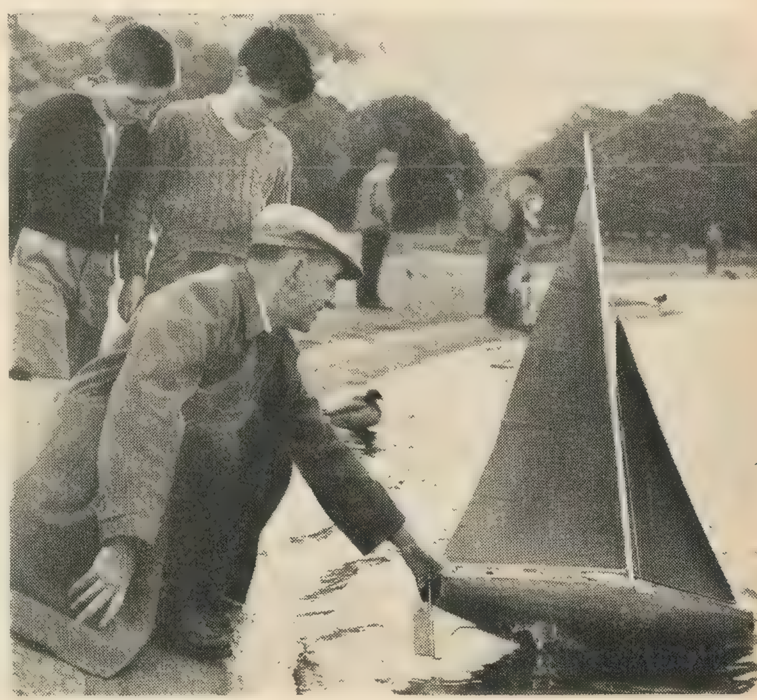
SIR,—I visited the Science Museum several times in the 1920s and remember seeing a full-size C and SL locomotive there, with the label mentioned by Mr Westcott [Postbag, March 14].

This had an additional interest for me as I was at that time an apprentice with Mather and Platt Ltd, Park Works, Manchester. From what I remember, the only " control gear " was an ordinary rheostatic starter mounted on one side of the body, a brake handle and an isolating knife switch. The collectors were heavy cast-iron flaps which rested on the conductor rail, presumably by their own weight. The whole thing was very light, small, and simple, compared with the complicated monsters of today.

We had, in the power house at Park Works, a model of one of these locomotives in a glass case, and my old boss, Bill Cunningham (foreman electrician), gave me the job of overhauling it. What a thrill for a third-year apprentice !

This model was about 2 ft long, so was made to quite a large scale, and was a proper working model, but very dirty and neglected. I took off the body, and everything else I could get off, but I couldn't get the motors out " no how," so I left them where they were, cleaning them up as well as I could. As far as I remember, the brush gear was the old type with copper-gauze brushes, but the motors had done very little running. There was no floor and no control gear, the motors being in series and connected to brass plates outside the cab ends.

Everything was very nicely made and fitted, all hand work, the various parts being numbered and marked l.h. and r.h. as in full-size practice. I noticed, through getting small parts mixed up, that the parts were not interchangeable, e.g., the big-end brasses from one side wouldn't fit the other side, and so on. All hexagon bolts had the heads filed up and nuts ditto. When finally cleaned and assembled, I gave the motors a run in series with a rheostat on 220 v. and they ran nicely, though not quite at the same speed.



John Scott of New Eltham, London, pictured at Kensington Round Pond, with a 36 in. sloop he has made from strips of shellacked paper

The brakes were operated by a screw and the operating handle passed through a long tapered steel column set at an angle, as in the original, the wheels being (I think) unsprung. There was nothing on the motors to indicate what the working voltage was, and I did not measure the voltage across each when running, as I should have done, but it may well have been they were made for 110 v. each, as the originals probably were.

I knew of three of these models—the one at Mather and Platts, one at the Science Museum, and one at the Manchester College of Technology, and there may have been others. Presumably they were all built by Beyer-Peacock, and "engined" by M and P.

Cape Town. A. E. F. SPENCE.

DOUBLE TROUBLE

SIR,—Replying to W. Ware's petrol blowlamps query [Postbag, June 20], I have had a lot of trouble with Max Sievert self-blowing blowlamps clogging with a resin-like deposit in the passages.

Though I was using non-leaded petrol I took the matter up with the Esso people. They then supplied me with a Solvent 40 petrol. I have had no trouble after using this for over 12 months. The blowlamp passages are free from deposit.

I have also had the same trouble as J. L. Clark, who wrote in the same issue about unsatisfactory castings.

I was supplied with cylinder castings by a well-known supplier who advertises in MODEL ENGINEER. Both cylinder castings show sand holes in the bore after boring same $\frac{1}{16}$ in. oversize. The cylinder covers will not clean up to size, also the slide-valve castings are too small.

The metal is very hard: it seems to be overheated. I can only turn same with a carbide-tipped tool. I had castings from another well-known firm; there was plenty of material and the metal was lovely to turn.

Machynlleth, Mont. R. LEWIS.

SIR,—If W. Ware uses the special blowlamp petrol SBP4 (Special Boiling Point) he will find it a perfect fuel, although the present price is 5s. 10d. per gallon.

I do not know whether this is the non-leaded spirit he speaks about but it neither clogs the nipples nor soots the boiler tubes as motor spirits do.

I obtain my supplies from Scottish Oils and Shell Mex Ltd whom I phoned today and who assure me that Mr Ware can get SBP4 in Birmingham from Shell Mex and BP Ltd, 65 New Street, Birmingham.

3½ in. gauge model of the shortest engine on the Danish State Railways

Scottish Oils also told me that this spirit is obtainable in England from the various branches of Shell Mex and BP in Scotland and from Scottish Oils and Shell Mex.

Edinburgh. Wm. M. ROBERTSON.

LITTLE SISTER

SIR,—I have been a subscriber to MODEL ENGINEER for years, and enjoy it very much. I have just completed *Halle*, a 3½ in. gauge locomotive, built to LBSC's "words and music." Her big sister was the shortest engine to run on Danish State Railways.

Connecticut. ROGER W. HANSEN.

STEAM CARS

SIR,—With reference to the article "A Steam Car Conversion Scheme" [ME, June 20], though this achieves the object of a conversion with perhaps the lowest possible cost, the would-be constructor would do well to bear the following points in mind.

The engine will not run as fast under steam as it did on normal i.c. operation. A piston speed of about 800 ft per min. is regarded as a fair maximum for efficient working. Even allowing 1,000 ft per min. this would only achieve say 3,000 r.p.m. peak revs, about two-thirds the engine's normal speed.

This means either alteration of gear ratios, or resigning oneself to very slow running. Another result of this low speed is a reduced power output. For instance, the very similar Bolsover Rodgers unit mentioned only developed 6.5 b.h.p. at 3,000 r.p.m. and 700 p.s.i., using two cylinders 44.5 × 89 mm. (270 c.c.). A proposed two-cylinder engine with a total capacity of 810 c.c. was expected to develop only 19.5 b.h.p. at about 3,000 r.p.m.

In the design illustrated, water condensate in the crankcase should be separated from the engine oil, hence a special separator is required. Also, seeing that the cooling system will doubtless be dispensed with, and with steam at 600 deg. F minimum, the crankcase will get very hot and even may require an oil cooler.

In view of this high temperature, of course, the usual aluminium pistons will have to be modified or replaced with heavier cast-iron ones, which will upset the balance on the engine.

One point that was not clear in the article was that if the clutch is unnecessary and, therefore, presumably dispensed with, or bolted up, how does one start the car when it stops with the engine in a non-self-starting position? Must the starter motor be used to move the whole car forward? Or must one disengage the gear, use the starter to start the engine, stop it again, and then re-engage the gear, in the hope that the engine is now in a self-starting position? Also, without a clutch, gear change in motion is difficult, so, must the car be brought to rest, if a change of gear is required?

One last point, for maximum efficiency piston valves, owing to the inevitable blow past of steam, especially without rings, are only suitable for use with compound engines.

It seems a great pity to me that this design should be put before the engineering public, as I fear it can only mean disappointment to any builders and consequent disrepute of steam cars in general. Nearly all the natural advantages of the steam car have been sacrificed in the effort to achieve a cheap conversion, which, in my opinion, is a false economy.

The British Light Steam Power Society has one excellent design for a two-cylinder compound, double-acting engine, and although this is much more expensive it could be built in the absolute confidence of getting good results.

This, after all, should be the aim of any engineering project.

Shere, Surrey. G. EGERTON.

CLUB NEWS

EDITED BY THE CLUBMAN

ALLEGED misreporting of a meeting has played a part in bringing about a complete break between the Miniature Motor Sport Club and the Model Rail Car Association. The two are no longer corresponding.

Back in April, when the association held its annual general meeting at Bath, the club delegates gave notice that the club intended to withdraw its affiliation. Later, in May, the club received from the newly-elected secretary of the association a copy of the minutes relating to the AGM.

The accuracy of these minutes was challenged, the club maintaining that its reasons for withdrawing had been confused with "a violent difference of opinion" between two people present on a separate matter altogether. As the club would not, of course, be represented at the association's next annual meeting, it asked for the minutes to be altered.

Rejected by association

According to T. H. Toogood, secretary of the MMSC, "a detailed explanation of these errors," together with a suggestion for overcoming them, was sent to the association on May 29. The association, however, returned the document on June 2, stating that it was out of order and that no representative of the club at a recent committee meeting had made any adverse comments on the AGM record.

"We are unable," adds Mr Toogood, in presenting the club's case to MODEL ENGINEER, "to reconcile the association's verbal and formal requests to reaffiliate with their offhand refusal to rectify errors in their minutes."

In these circumstances the club's committee has asked Mr Toogood to end correspondence with the association as soon as possible. "It has been suggested by one or two members," concludes Mr Toogood, "that we affiliate to the senior MCA, but we should require to see greater interest, by this august body, in rail racing before committing ourselves to such a course."

Here are the reasons, as set out by Mr Toogood, for the club's withdrawal from the association:

> The facilities afforded by the association are not in proportion to the subscriptions paid. We are of the opinion that this club's annual expenditure on the association can be put to a use that will be of greater benefit to all members.
>
> It is felt that the president of the association has brought some influence to bear upon members of the association whereby their activities have been restricted to such a degree that they have been unable to make decisions for themselves.

When the delegates to the AGM gave notice of the club's resignation, the chairman asked them to have the decision reconsidered by the members. The formal confirmation of withdrawal was given on May 2. In it the club quoted the relevant passage from the record of its own annual meeting on April 24 when the motion for withdrawal was carried.

ME DIARY

July 13 Chester-le-Street Rally. Hastings carnival exhibition ends.
July 14 Sussex MLS visit by Romford Society.
July 20 Huddersfield SME track at Greenhead Park for summer entertainments (July 20-Aug. 4).
July 21 Southend MPBC local regatta, 2.30 p.m.
IRCMS at Kingsley Hotel, London.
Worcester and District public running day, Diglis, 11 a.m.
MPBA radio-control regatta, Taplin Trophy. Birmingham SME visit to Derby Works and Museum.
July 22 Thomas Telford Bicentenary Exhibition, ICE, London (opening by Minister of Power); July 22-Aug. 10, 10 a.m.-8 p.m.
July 27 Kegworth Carnival and Traction Engine Rally, 12.15 p.m.
REC camping coach holiday, Ferryside, Carmarthen (July 27-Aug. 3).
July 28 MPBA Regatta, Southend, 11.30 a.m.
August 2 Rochdale SMEE open meeting.
August 3 REC camping holiday ends.
August 4 MPBA Regatta, St Albans.
IRCMS contests, Wellesbourne Aerodrome, Wellesbourne Mountford, Stratford-upon-Avon (aircraft and land vehicles).
August 5 IRCMS contests for boats, Valley Pool, Bournville, near Birmingham (August 5 and 6).
Southend MPBC Regatta, 2.30 p.m.

PHOTOGRAPHIC COMPETITION

ENTRY FORM

(To be pasted on the back of each entry)

Name...
(Block letters)

Address..

....

If member of a club, give its name ....

....

I agree to the conditions and certify that I took the picture submitted.

Signed..

DETAILS OF PHOTOGRAPH

Title ....

Builder of model(s) in picture:

Name ....

Address ....

....

Further details of model(s)..........................

....

....

Camera..................... Exposure...............

Film or plate............ Lighting.......................

Stop..................

Any other information................................

....

....

CONDITIONS OF ENTRY

1. The photographs submitted shall be of any form of model engineering and must be taken by the competitor but may be developed commercially. Prints should be unmounted, not more than 10 in. x 8 in. and not less than half-plate (4½ in. x 6½ in.).
2. Competitors may send more than one photograph but each must have a coupon from Model Engineer firmly pasted on the back. Coupons will be published each week until the closing date.
3. The closing date will be July 31. Entries to be sent to: Photographic Competition, Model Engineer, 19-20 Noel Street, London, W1.
4. A first prize of £10 will be provided, with second prize of £5 and third of £3. In addition, 10s. 6d. will be paid for each other photograph published in Model Engineer.
5. Prints will not be returned and the Editor reserves the right to publish any of them in Model Engineer.
6. Copyright of photographs sent must rest with the competitor.
7. The decision of the Editor shall be final in any question affecting the competition.

Model Engineer

Classified Advertisements together with remittance should be sent to Model Engineer, 19/20, Noel Street, London, W.1, by latest Thursday morning prior to date of publication. Advertisements will be accepted from recognised sources by telephone. GERRARD 8811. Ex. 4

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WORKSHOP EQUIPMENT

Buck & Ryan for Lathes and Workshop Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone: Euston 4661.

Good Cash Prices offered for old "Atlas" 5" lathes (or similar) or can be used against the supply of a new machine of any make with balance over hire purchase 12, 18 or 24 months. Write with details of make and condition, equipment offered and price required to—THE ACORN MACHINE TOOL CO. (1936) LTD., 610-614, Chiswick High Road, W.4. or telephone CHIswick 3416.

New Tool Bargains. Sets of H.S.S. twist drills on stands, complete. 1/16"-½" × 1/64", £3 10s. Letters A to Z, £2 15s. 1-60, £2 10s. H.S.M.T.S. twist drills 7/16", ½", 9/16", ⅝", 11/16", ¾", ⅞", 32s. 6d. set. H.S. hand par reamers 11/32", ⅜", 7/16", 9/16", ⅝", 15s. set. H.S.M.T.S. reamers ⅛", 7/32", ¼", 9/32", 12s. Ditto 5/16", ⅜", 7/16", 15/32", 15s. Ditto 17/32", 19/32", ⅝", 21/32", 17s. 6d. Ditto ¾", 25/32", 13/16", ⅞", 25s. H.S., M.T.S. spiral endmills 9/16", ⅝", 11/16", 12s. H.S. S. & F. milling cutters, 4" × ½" × 1", ditto ⅝" and ¾", 25s. each. All first class makes. Postage extra please.—ATTFIELD, 221, Green Lane, New Eltham, London, S.E.9.

Surplus Lot. Wimet tungsten carbide tooltips fot tipping ½" dia. lathe tools. Set of eight tips, 10s., sample tip, 1s. 6d.—Box No. 8559, MODEL ENGINEER Offices.

£65 Myford Super 7, motorised, 3-jaw, drill chucks, various tools, very little used.—2, Isabella Road, Homerton, London, E.9.

Jigsaw Table 8" × 6", throat 8½". Uses Eclipse Junior or coping saws, 3-speed countershaft, £5 10s., photo.—Box No. 8563, MODEL ENGINEER Offices.

Ward Capstan Lathe, 2¼" capacity, fitted 2", ball chuck, belt drive with countershaft, £50. Norton plain grinder 3" × 18", b/c, motorised, 400/3/50, overhauled, £50.—J. H. LINES, 46, Stone Road, Stafford.

Contents Workshop. Precision "Star" lathe, 9" swing, chucks, tools. Sole user, bought new, £100. Seen—7, Pinewood Road, Newton Abbot.

Motorised ML7, chucks, vertical slide, many accessories. ½" bench drill. 3½" Adept shaper. 4½" Selecta grinder, micrometers, numerous H.S.S. tools, about 45 M.E. handbooks, over 400 MEs, £80 the lot. Going abroad.—SGT. HUDSON, R.E.M.E., 13, Cotteshore, Bordon, Hants.

3½ h.p. Lister Engine with countershaft and 12 volt lighting set. 3½" Myford lathe with stand and accessories, pedestal drilling machine, grindstone, buffer, air compressor, and hand shaper with dividing head. All in perfect condition, £150 o.n.o.—BRYANT, Burleigh, Fir Acre Road, Ash Vale, Aldershot.

Zyto 3⅜" Lathe, B.G.S.C., countershaft, motor, stand, chucks, 10" saw bench, £40, sell separately.—WILTON, 11, Elizabeth Fry House, Croyde Ave., Hayes, Middx.

"Atlas" capstan/turret tooling for any make of machine, new, at ridiculously low prices. Send for fully illustrated, descriptive and priced leaflet to—THE ACORN MACHINE TOOL CO. (1936) LTD., 610/614, Chiswick High Road, W.4. (Telephone No. CHIswick 3416, 5 lines.)

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St. Ninian, scale bollards, windlass, etc., supplied. For sale, Pultra lathe, £7 10s. stamp please.—WRIGHT, 13, Park Drive South, Hoole, Chester.

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Wanted. Ship models, warships and merchant ships, scales 1" = 100' or smaller, any quantity, write and describe. Especially want models by Bassett-Lowke and Viking —offer £3 for Viking harbour set complete—also World War I indent, models by Boucher of New York. Naval Intelligence ship identification manuals World War I or II. These editions only: Jane's "All the World's Aircraft," 1909, 1914, 1918, 1919; Weyer's "Flottentaschen buch," 1922, 1942/43; Clowe's "Naval Pocket-Book," 1914.—Below.

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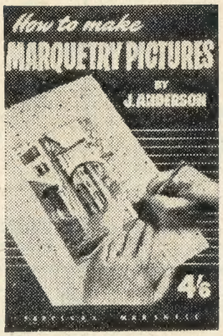

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